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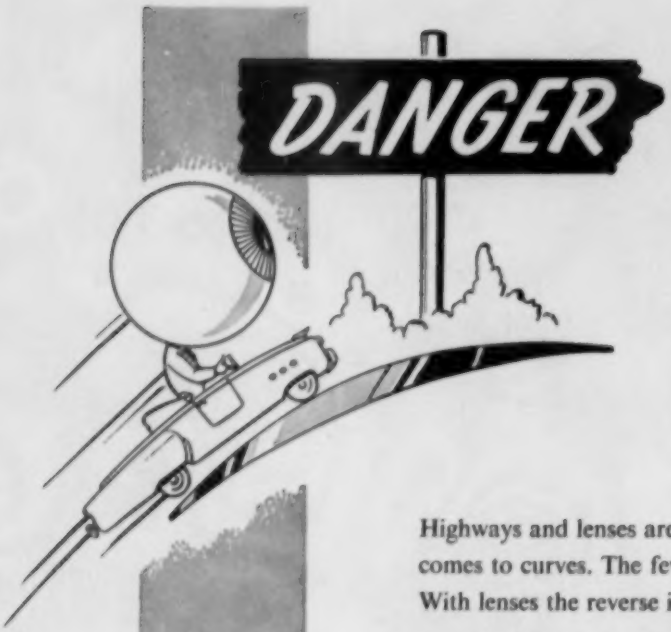

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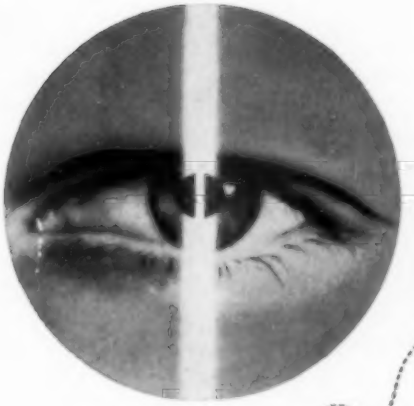

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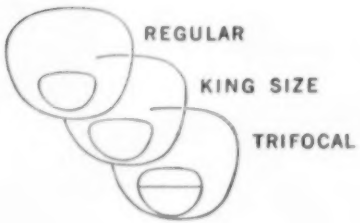

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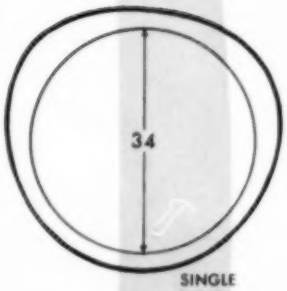

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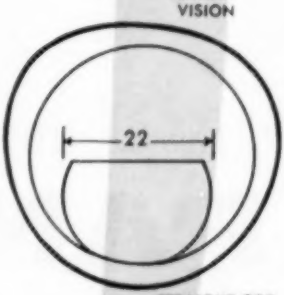

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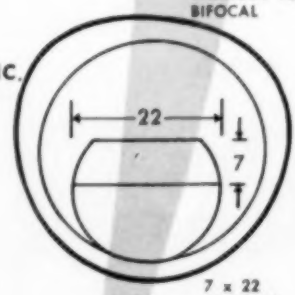

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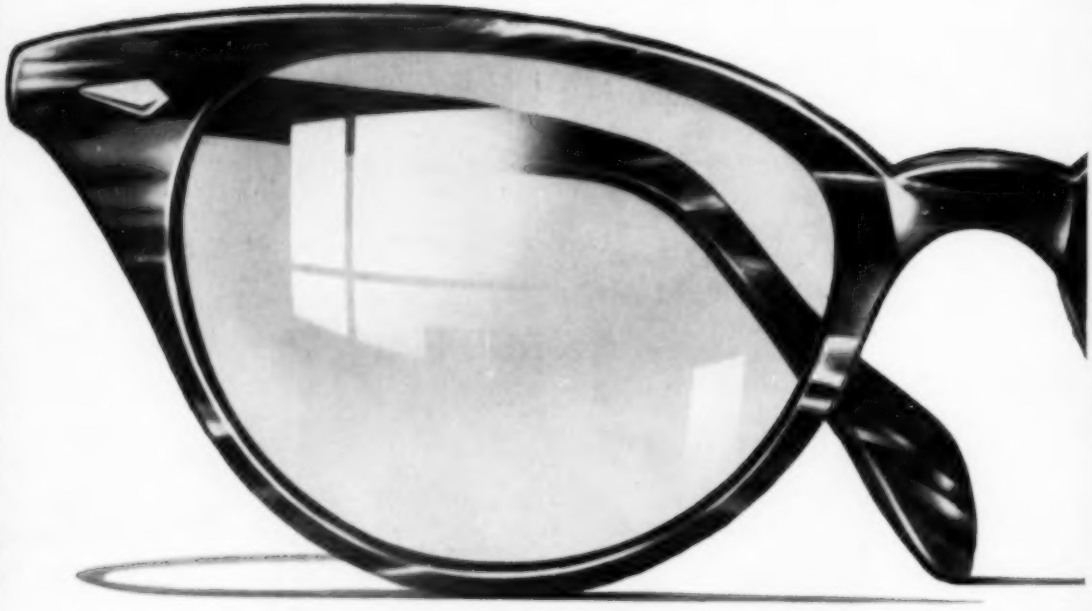

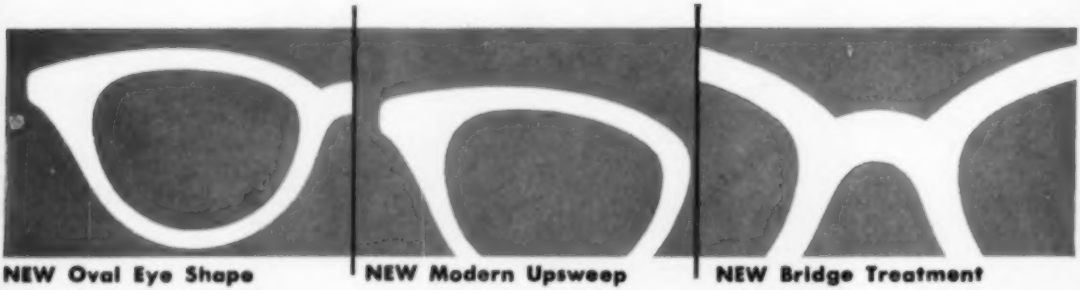

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VISUAL AND READING IMPROVEMENT IN INDUSTRY*

BANK PERSONNEL

Howard N. Walton†
Los Angeles College of Optometry
Los Angeles, California

INTRODUCTION

For the vast majority of bank personnel maximum performance and efficiency in the visual, perceptual and reading skills is of paramount importance. The nature of bank operations and functions places heavy demands upon these skills.

Recognizing this problem the American Institute of Banking asked that a program be developed that would provide this type of training.

In a perceptual training program for clerical operations, Slade & Walton[1] pointed out the advantage of adapting slides for particular needs. Therefore it was decided that to meet specific banking perceptual and reading problems special slides would have to be developed and a portion of the practice reading materials would be taken directly from banking journals.

The training program was designed to achieve the following:

1. Develop and train the visual skills used in effective reading.
2. Develop and train the perceptual skills used in effective reading and specific clerical operations.
3. Develop and train the reading skills essential for effective reading.
4. Increase reading speed of generalized and technical material while maintaining or increasing comprehension.

VISUAL CONSIDERATIONS

Eminent philosophers for many years had assumed the truth of the common belief that in reading the eyes swept smoothly across a line of print. In 1878 Javal by simply watching the eye of a school child in the act of reading observed a series of saccadic movements with intervening fixation pauses.

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Subsequent experiments proved that clear vision of an object is obtained only from a relatively motionless image on the retina. The saccadic movement does not provide motionless images under any ordinary conditions, but gives blurs and streaks which are very brief due to the speed of the saccadic movement and very faint with ordinary fields of view. Consequently these momentary blurs are not disturbing and are habitually disregarded.[2]

These discoveries made it apparent that a large span of recognition was desirable during each fixation. Training an individual how to make his fixations so as to take advantage of his peripheral vision nasally and temporally provides the basis for increasing the span of recognition.

Dr. D. L. Cleland[3] director of the Reading Laboratory, University of Pittsburgh, states that, "I sincerely believe that slow or sluggish fusion is the direct or indirect cause of more reading failures than the records show."

Robinson and Huelsman[4] report an investigation in which different visual scores were studied in relation to reading achievement. The resulting coefficients of correlation led to the conclusion that exophoria and duction weaknesses were most closely related to reading failures.

There has been considerable confusion regarding the general character of fusion and reflexes associated with the fusion mechanisms because the sensory or perceptive function has not been differentiated properly from the motor innervational reflexes which regulate the position of the eyes so that retinal images may be received on corresponding retinal areas. To state it succinctly fusion consists of motor and sensory components. Convergence may be considered as any movement or state of fixation of the eyes in which the angular position assumed by the visual axes relative to each other differs from the previous posture.[5] In a reading situation the distance of the print from the eyes varies depending upon the extent of hand, head and posture movements. Therefore the amount of fusional convergence activated depends upon the distance and A.C.A. ratio.

W. C. Ruediger[6] presented tachistoscopically to his observers a white card on which was printed an "n" or a "u" at varying distances from a central fixation point. The card was 30 centimeters from the reader's eye. It was found that indirect vision was still satisfactory for perception of 11-point type when the letter was about 2½ centimeters on either side of the central point. These data would indicate that the external boundaries of the range of indirect vision include 24 to 30 ordinary printed letters or approximately five words of five letters each.

Yet, the average span of recognition for a college student, reading non-technical material, is 1.25 words per fixation.[7] On a 10-word line he must therefore make and break fusion eight times or approximately 272 times per page. A study of ophthalmographic film strips by Carmichael and Dearborn[8] show that the eyeballs tend normally to be relatively diverged at the end of reading a line of print. During the return sweep, they tend to converge; this convergence represents, on the average, a 1° shift in the line of regard of the eyeball. While reading the line of print the eyeballs tend to diverge again. Most of this divergence occurs during the first fixation. Therefore, ample motor and sensory fusion become necessary factors for maintaining fusion after each saccadic movement and thus basic visual skills for efficient reading.

Michaels[9] states that the best indication of convergence malfunction seems to be the near point of convergence with the adductor findings as auxiliary indicators. Thus, a motor fusion deficiency is easily recognized and excellent results may be achieved by means of simple training techniques.

Sensory fusion provides a tolerance upon which the rotary muscles must operate. The extra-ocular muscles are not steel rods actuated by a mechanism with its parts machined to a millionth of an inch. They are living tissue with all the physiological variability of living tissue, and are controlled by neural mechanisms also with physiological variabilities. From a motor standpoint then, Panum's areas "takes the pressure off" the extra-ocular muscles and allows them to be reasonably inaccurate in their setting without decrement of performance.[10] From a reading standpoint then, exact fixation is not required to regain fusion after each saccadic movement. In reading it is important to know how much leeway the extra-ocular muscles have in positioning of the eyes and how much of Panum's areas have been used as the result of a heterophoria or fixation disparity.

Ogle[11] in discussing Panum's fusional areas reports that Volkmann measured his own sensory fusion area and determined it was 12.1 minutes of arc. By practice he was able to enlarge the area to 25 minutes of arc. This represented an increase of more than 100%. Walls[12] suggests that the visual training armamentarium should incorporate means of attempting to increase the size of the sensory fusion areas.

Woodworth[13] reports that the greatest amount of time is spent fixating the first quarter of a line of print. Ophthalmographic records indicate that over-convergence and then divergence after the long return sweep apparently contributes to this proportionately longer period of

time required for the first quarter of the line. By the development of large areas of sensory fusion, exact positioning of the eyes in making fixations is not necessary. This is of particular value in making the first fixation of a new line after a long return sweep.

In experimental work in book retinoscopy, Crow[14] has noted reflex changes of .50 to 1.00 diopter when the subject suddenly comes upon a difficult word or one which he does not recognize or when a transition is made from easy to difficult reading material. Under these conditions the visual axes would be changed by the amount of the A.C.A. ratio. Clear vision is maintained due to the depth of focus, however, a latitude of sensory fusion is necessary for maintaining binocularity while necessary fusional convergence adjustments are activated.

Adequate motor and sensory fusion, therefore, are basic and essential visual skills for binocular reading efficiency.

PERCEPTUAL CONSIDERATIONS

Industrial training by use of the tachistoscope, without implementation of other instruments or procedures, has been reported by Renshaw.[15] Gains of 20% in reading rate and 33 percentile ranks in comprehension were achieved. Renshaw[16] defines the form field as the solid angle within and beyond the region of the anatomical macula in which an observer is able to see shapes. Form is a highly complex sensory-cerebro-motor process which usually operates at a low point of efficiency in the untrained. Renshaw was able to increase the total form fields from 4 to 6 times that shown previous to training. The value of increased form fields for clerical employees is obvious.

It is important to remember that a basic concept in tachistoscopic training is teaching the subjects to fixate so as to take full advantage of the retinal cone mosaic nasally and temporally. This will increase the number of words or digits grasped at a single fixation. The perception of groups of words comprising sentences or phrases can become a coherent, perceptual unity, just as an aggregate of single letters can and does become a unitary word.[17]

The analysis of several thousand errors made in the reproduction of exposed figures has thrown light on the relations of form and content in the perception of tachistoscopically exposed forms. It is quite common for observers, early in the course of training, to reproduce all digit components correctly but with inversions and other errors of position. The formal process is more fundamental than the mere mastery of content. The achievement of perceptual skill involves the establishment of a frame of reference into which the content is fitted, with whatever degree of success conditions permit. Anything which disturbs

this frame of reference which is essentially motor in character, inevitably results in error.[18]

Changes in accommodation as the result of nervousness and tension cause changes in accommodative convergence with a resultant adjustment of fusional convergence. It may be postulated on the basis of Renshaw's work that the resultant motor movement interferes with the ability to perceive accurately. This would seem plausable in the presence of a high A. C. A. ratio and restricted sensory fusion. Subjects under tension or strain on occasion will report that they only observe the central part of an exposed target, and fail to see that which appears in the periphery. Burian[19] in research regarding the role of fusional movements indicates two mechanisms which subserve binocular vision, one central, the other peripheral. He believes that an individual may suppress either the peripheral or central part of an image. A failure to see the extremities of a target when the subject is under tension would indicate a suppression of peripheral vision.

Another factor giving rise to these perceptual difficulties is the mutual interference or masking of the letters. On a perimeter isolated letters were read further out than words and the longer a word the closer it must be brought to the fixation point.[20] The effect of the stimulation of one area of the retina upon an adjacent stimulated part is known as simultaneous contrast.[21] In a tachistoscopic exposure the first and last digits or letters in a group suffer less from masking than the interior letters. At either end, one side of the letter is free from the interference of adjacent letters.

By increasing the span of recognition by tachistoscopic training, Barnette [22] has reported that some bank employees could see 15 digits at 1/100 of a second and other subjects achieved reading speeds of over 1,000 words per minute. The type of reading material used was not mentioned. By use of the tachistoscope, Renshaw[23] has also reported gains in reading rates which exceeded 1,000 words per minute.

Sherman[24] is of the opinion that if a person looks attentively at an object without moving his eyes, he will see it as a perceptual unit. If one is exposed to an object for so short a time that his eyes cannot move, he is automatically required to see it with perceptual unity. This is another elementary skill achieved by tachistoscopic training. In reading, a large span grasped at each fixation provides the basis for increased speed and comprehension.

The application of perceptual testing in industry has been evaluated by Industrial Psychology, Inc.[25] Of 10 basic mail order jobs studied, and of 12 tests used, the tests measuring perception aptitude correlated most significantly with clerical jobs.

Thus, improved perceptual ability becomes an important asset for reading as well as clerical operations.

READING SKILLS

It is a well-known fact that many adults have not developed reading habits commensurate with their mental power or capacity. As Simpson[26] has stated the causes and reasons are numerous, but the primary cause is a lack of training over an extended period of time. Reading instruction for those who are adults today was terminated at the end of the third or fourth grade, and consequently many adults have taken their undeveloped reading habits to jobs demanding greater effectiveness. However, the recognition of reading as a developmental, life-long process has resulted in an increase in the facilities available for training adults to become more proficient readers after they are out of school.

In view of some of the obvious difficulties in learning to read, it is understandable why efficient reading requires long practice. Some of these problems are as follows:[27] (1) The written or printed symbols are two stages removed from their meaning. They represent speech sounds which in turn stand for objects. (2) The alphabet is phonetically very imperfect, even with "reformed" spelling. (3) Instead of looking freely about the page as in the ordinary use of the eyes, one must regiment the eye movements so that they shall move along the lines of print.

Even in adulthood vocalization of words and sometimes syllables persists. This may be in the form of a cortical vocalization where the reader hears a page of print as he pronounces the words in his mind or manifest itself as a motor movement of the tongue, lips, vocal cords, larynx, inner palate, throat, fingers or head.[28] To sweep the finger across a line of print is valueless as it can only be followed by making a pursuit movement of the eyes, in which case the print cannot be seen clearly. Frequently individuals are noted reading and simultaneously making head movements from left to right. In this situation the eyes immediately make a compensatory movement in the opposite direction to main fixation at the point of regard. Reading in this manner requires additional energy without benefit to the subject.[29]

From seventy to ninety per cent of the reading matter of adults as well as bank personnel is practical prose—that is, nonfiction which is read primarily for information, rather than for enjoyment or esthetic or philosophic appreciation. Some of the techniques for developing effective reading skills, that is, the highest speed which will allow the desired comprehension in reading practical prose are as follows:[30]

1 Pre-reading. In an article or book chapter, read the introduc-

tory paragraphs thoroughly, skim the remaining paragraphs until you reach the concluding paragraphs which are to be read thoroughly. In a book examine the table of contents and index, skim the prefatory material; then pre-read and read the first and last chapters, and any other chapter which seems to have a summarizing function.

2. On the basis of pre-reading, decide whether to skip, skim or read thoroughly. When skimming, employ your knowledge of paragraph organization to gather in the main ideas and important details.

3. After pre-reading, formulate questions to keep in mind while reading thoroughly. The most important questions are these: (a) What is the thesis or problem of the selection? (b) What is the purpose of the selection? Why is the author presenting this information on this occasion? What seems to be the author's own sentiments on his subject? What conclusions does he want the reader to draw, and for what reason? (c) What limitations are imposed on the discussion? (d) What particular information or ideas do you, the reader, want from the selection?

4. When reading thoroughly, read phrases and short sentences, not words, at your top comfortable rate.

5. When you meet an unfamiliar word, or a word used in an unfamiliar way, deduce its meaning if you can from its stem, prefix and suffix, or from the context in which it is used.

From the standpoint of native born Americans, the Anglo-Saxon element in our modern English vocabulary is the most easily understood and presents the fewest difficulties in either use or comprehension.[31] However, for the foreigner the Anglo-Saxon words frequently present the greatest obstacle since the root words and their derivatives vary perplexingly and oftentimes controversially. Thus the representation of each Anglo-Saxon word must be learned by the immigrant while it is merely a developmental process for the native child.

PARTICIPANTS

Bank personnel from Los Angeles and suburbs participated in the training program. Since the subjects varied as to educational background and experience they were grouped on an executive or clerical level so as to provide homogenity.

The executive group comprised one class while bank clerks and bookkeepers of various types made up two additional classes. The combined group of fifty-six participants were representative of bank employees from numerous departments. The training was conducted as part of the educational program of the American Institute of Banking.

DIAGNOSTIC TESTING

Each member of the group was given an initial battery of diagnostic tests to determine the level of his starting skills. The series consisted of the following:

1. Visual Survey—A screening procedure similar to that developed by the Los Angeles College of Optometry for school surveys was used. It was administered by two optometrists and included the following:
   (a) Complaint
   (b) Visual acuity
   (c) Cover test
   (d) Near point of convergence
   (e) Ophthalmoscopy
   (f) Retinoscopy
   (g) Habitual lateral phoria—distance
   (h) Habitual lateral phoria—near
   (i) Compensating ductions
   (j) Vertical phoria
   (k) Retinal rivalry—to determine any gross suppression.
2. The Wonderlic Personnel Test—A standardized mental alertness test designed for testing adults in business and industrial situations. It is useful as an indicator of the individual's potential.
3. The Inglis Vocabulary Test—A standardized test designed to measure the student's knowledge of the intelligent general reader's vocabulary.
4. Study Type of Reading Exercises—Dr. Ruth Strang—The booklet covers the various aspects of efficient reading without involving the reader with technical details. Determination of reading rate and comprehension at the beginning and conclusion of the training indicated the improvement in reading material of this difficulty.
5. S.R.A. Better Reading Book 2—E. A. Simpson—This material, while generalized, requires that the reader remember details such as dates, names, places, events, numbers, descriptions, etc. Twenty questions are given at the conclusion of each 1,350-word article. An article from this book was read prior to commencement of training, at every other session and at the end of the training.
6. Effective Reading—Dr. S. E. Herr—A workbook containing reading, comprehension, perception and vocabulary exercises.

Alternate exercises given at intervals indicated the extent of improvement.

7. Perceptual Level—Determination of the perceptual level for digits and words by use of the tachistoscope.

EQUIPMENT USED IN TRAINING

To obviate the possibility of boredom, laxity and disinterest which might conceivably arise in a group of mature individuals, the following various types of equipment and slides were used.

Harvard Reading Films—A series of 16 films which were increased in speed from a starting rate of 250 words per minute with 5 fixations per line to 585 words per minute with two fixations per line.

S.V.E. Projector—Used to project the following film strips: "Improve Your Reading" and "Learning to Study Series."

Keystone Reading Pacer—An instrument with a rod-shaped pacing arm which gradually develops the reader's ability to increase speed and comprehension. (Used by students before or after regular training sessions or during spare time.)

Keystone Tachistoscope—An overhead projector with an exposure control device similar to that of a camera. This instrument provides a means of training perceptual and reading skills. In addition by use of the stereo-motivator attachment, fusion training was administered. Various types of slides described below were projected on the screen. The exposure time varied depending upon the particular skill being trained.

Keystone Visual Span Series—Digit slides starting with a span of four digits and progressing to a span of eight.

Keystone Phrases and Sentences, Level II—Ranges from two-word phrases to five-word sentences.

Barnette Paragraph Tachistoslide Series—Paragraphs consisting of 100 to 120 words related to some aspect of reading.

Configuration Slides—Various patterns flashed on the screen and organized as a unitary whole and associated with some familiar object. The purpose being to develop the Gestalt principle of wholistic seeing.

Minnesota Efficient Reading Tachistoslide Series—Slides designed for the purpose of vocabulary development.

Stereo-Motivator Series—The B. S. M. and K. S. M. Series—Used for the purpose of enhancing the fusional skills.

Special Slides—Developed from banking periodicals and books for the purpose of maintaining the terminology peculiar to bankers and to provide a means for direct and immediate transference to actual banking situations. Other slides were produced directly from materials

used in specific operations encountered in banking procedures.

Description of Special Slides — Digits — Handwritten — starting with a span of four digits and progressing to a span of seven.

Digits as recorded by bookkeeping machines—printed numbers marked off by commas in units of three digits with a period setting off the last two columns.

Phrases—Banking terms comprising three-word phrases taken directly from bank periodicals and books.

Sentences—Banking terms comprising four and five word sentences taken directly from bank periodicals and books.

Bank Paragraphs—Paragraphs of reading material of approximately 110 words taken directly from bank periodicals and books.

Bank Periodicals—The Monthly Review—A bank periodical was used for timed exercises in reading skills development.

PROCEDURE

The training was conducted in the classrooms of the American Institute of Banking so that controlled lighting made it possible to reduce to a minimum the brightness difference between adjacent surfaces. Two of the three classes met twice per week while the third class convened once per week. Each session was a two-hour period and each group was given a total of 24 hours of training including the diagnostic testing.

At the opening of each session a fifteen minute lecture was given on pertinent subject matter. By the conclusion of the program, the visual, perceptual and reading skills necessary for effective reading along with related topics had been discussed. This provided a theoretical basis for the training and gave impetus to short group discussions relative to application for specific job situations and in other generalized areas.

Following the lecture the visual skills important to reading—motor and sensory fusion—were trained. This was achieved by use of the stereomotivator attachment for the Keystone Tachistoscope and forms 122 and 127 printed by Allbee and Son Co., Waterloo, Iowa.

Next a Harvard Reading Film was shown and the comprehension questions answered. In each succeeding film the speed and the span of recognition was increased. These films were highly motivating.

A visualization exercise provided practice in the ability to read and simultaneously draw mental images and reproduce them accurately within a limited period of time. Visualization is an important aid to memory and recall.

Vocabulary from Dr. Herr's book, "Effective Reading" was briefly introduced with emphasis on prefixes, roots and suffixes. At alternate sessions during this time film strips were shown.

A 10-minute break alleviated possible tensions, strain or fatigue. The intermissions allowed time to chat informally with the students and provided information valuable in directing the program.

The next 20 minutes were given to tachistoscopic training. The various slides including the special bank slides previously described were used. To increase the span of recognition, eye movements must be eliminated and the subject must learn to fixate so as to take full advantage of his peripheral vision nasally and temporally. Since an eye movement of 5 degrees may be executed in 29 milliseconds, all tachistoscopic exposures were given at 1/100 of a second.[32] The Barnette and bank reading paragraphs were started with 40 second exposures and gradually reduced to 20 second exposures.

Particular emphasis and additional time was devoted to the special slides developed directly from banking materials because this portion of the session always elicited considerable enthusiasm and spirited competition.

Each session was concluded with objective timed reading exercises to test the development of speed and comprehension. The exercises used were designed by Dr. R. Strang of Columbia University and E. Simpson of Science Research Associates. Other reading materials were taken directly from banking periodicals.

It was repeatedly stressed and shown how these skills must be immediately applied to daily reading activities and clerical tasks as new skills become ballistform only when you practice in the manner in which you wish to ultimately perform.

RESULTS

The Visual Survey, Table I, showed that 12 participants or 21.42% failed the screening tests. Another 9 or 16% were placed in a borderline category. Of this latter group two were slightly myopic and were assigned front row seats. The others showed that the ductions were not quite adequate according to Sheard's criterion to compensate for the phoric state of the eyes. Of the 12 failures one was amblyopic, one under care and a third did not seek further visual care. The remaining nine had complete eye examinations. Copies of the occupational vision panel were available to those who failed the visual survey tests and who did not have an eye doctor of choice.

The median scores on the Inglis Vocabulary Test for Students at different grade levels is as follows:

Twelfth-grade Students	58 percentile
College Freshman	70 percentile
College Graduates	86 percentile

TABLE I
VISUAL SURVEY

IDENTIFICATION	BORDERLINE	FAILED	FURTHER VISUAL CARE
Supervisor	Phoria and Ductions—Near		V.T.—Class and Home Training
Bank Operations		Vertical Phoria	Examination
Training Director	Phoria & Ductions		V.T.—Class and Home Training
Assistant Cashier		Acuity Phoria, Ductions—Near	Examination
Bookkeeper		Retinoscopy	None
Collections		Retinoscopy Acuity (Dist.)	Examination
Teller	Phoria & Ductions		V.T.—Class and Home Training
Collections		Retinoscopy	Examination
Teller		Retinoscopy Vertical Phoria	Examination
Teller	Phoria & Ductions		V.T.—Class and Home Training
Operations	Retinscopy (Slightly Myopic)		Assigned Front Row Seat
Collections	Phoria & Ductions		V.T.—Class and Home Training
Reviewer		Retinoscopy Acuity	Examination
Clerk	Phoria & Ductions		V.T.—Class and Home Training
Bookkeeper		Acuity Vertical Phoria	Under Care
Training Director		Retinoscopy Acuity	Examination
Teller	Retinoscopy (Slightly Myopic)		Assigned Front Row Seat
Bookkeeper		Retinoscopy Suppression	Examination
Teller		Acuity (O.D.)	None—Amblyopic
Research Assistant		Retinoscopy Acuity, Ductions	Examination
Asst. Trust Comptroller	Phoria & Ductions		V.T.—Class and Home Training

Table II shows a mean score at the 68th percentile for the group.

TABLE II
INGLIS VOCABULARY

NUMBER	MEAN	S.D.	SE MEAN
56	68	15.7	2.1

From the standpoint of vocabulary the primary purpose was to introduce methodology that would provide a basic procedure and foundation for future enhancement. Since only a limited time was devoted to vocabulary development per se, an alternate form of the Inglis was not administered at the conclusion of the training.

The Wonderlic Personnel Tests were designed for testing adults in business and industrial situations for the purpose of examining and measuring mental ability levels. By use of a table, scores may be converted to Otis Mental Ability test scores, higher form.

The mean score on the basis of all educational levels was the 68 percentile as shown in Table III.

TABLE III
WONDERLIC PERSONNEL TEST

NUMBER	MEAN	S.D.	SE MEAN
40	68	19.5	3.08

To avoid the possibility of misinterpretation of its significance, the management decided the test should not be given to the executive group. Results from this section would undoubtedly have increased the average group score.

Determination of a perceptual starting level by use of the tachistoscope showed that all trainees achieved four digits and two word phrases at 1/100 of a second. At the termination of the training, consistent success was shown by the group on 6 digits and 4 word sentences with an exposure time of 1/100 of a second. At this same speed 59% were able to reproduce accurately 7 digits and 56% could grasp five word sentences. Experimentally several in the group achieved 8 digits, however training was not conducted at this level.

Each individual maintained a profile sheet on which was plotted the results of each session. Increased reading rates and comprehension of generalized and detailed materials was obvious and therefore a constant source of encouragement.

The average reading rate for the group before training, Table IV, was 232.8 w.p.m. with 77.5% comprehension, and at the conclusion of the program 417 w.p.m. with 82.1% comprehension. Thus an increase of 79.1% in reading rate and 5.9% in comprehension was achieved. The effective reading rate, which is calculated by multiplying the rate by the comprehension shows an 87.4% increase.

To establish the import of the improvement in reading rate and comprehension, it was necessary to prove statistically that the gains made were significant to the extent that only by chance could such differences occur 1% or 5% of the time.

The analysis was made by the method of paired comparison. It consisted of finding the individual differences between the pre and post training scores. These differences were squared. The preliminary calculations were then used to determine the mean difference and the standard deviation of the mean difference. From this information Fisher's t ratio was calculated.

TABLE IV
ANALYSIS OF READING RATE AND COMPREHENSION
READING MATERIAL SRA—N = 56

WORDS PER MINUTE						COMPREHENSION						t–VALUE
BEFORE			AFTER			BEFORE			AFTER			2.621–1% Level
		SE			SE			SE			SE	3.388–1% Level
Mean	S.D.	Mean	Mean	S.D.	Mean	Mean	S.D.	Mean	Mean	S.D.	Mean	W.P.M. Comp.
232.8	49.93	6.67	417	112.42	15.03	77.5	10.66	1.42	82.1	9.3	1.24	15.04 2.662

EFFECTIVE READING RATE*
WORDS PER MINUTE

BEFORE			AFTER		
MEAN	S.D.	SE MEAN	MEAN	S.D.	SE MEAN
183	52.89	7.07	343	103.49	13.83

*Words per minute times comprehension.

The analysis showed that significant increases were achieved in reading rate at the .001 level of probability and in comprehension at the .01 level of probability.

The smaller standard deviation in comprehension after training indicates less variability than previously among the members of the group in gaining meaning from the printed page.

Other benefits not easily measured by usual standards were reported in a questionnaire filled out by each participant at the termination of the training. These subjective responses included: The ability to generally work faster and to complete routine duties more quickly, an increased desire to read and study, more enjoyment from recreational reading and of paramount importance increased self-assurance and confidence.

SUMMARY AND CONCLUSIONS

A visual and reading improvement program was patterned for bank personnel. It was designed to develop and train the visual, perceptual and reading skills essential for efficient clerical operations and effective reading.

Three groups comprised of 56 bank employees participated in the project.

Special slides were developed from banking forms and literature, and reading exercises were taken directly from banking periodicals.

Slides designed for a definite purpose, stimulate interest and provide a more direct and understandable means of transference to a specific industrial situation.

Statistically a significant increase in reading rate was achieved at the .001 level of probability and a significant increase in comprehension at the .01 level of probability.

Perceptually the span of recognition was increased for words and digits.

Visual, perceptual and reading training may be specifically designed for a myriad of executive, clerical or general industrial situations.

Certain intangible personal satisfaction, difficult to measure by usual standards, emerged as beneficial. This included the development of self-assurance and confidence which gave rise to a more relaxed individual able to perform under less tension.

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AMERICAN ACADEMY OF OPTOMETRY

NEW ACADEMY MEMBERS

The following optometrists and educators have been elected to Fellowship in the American Academy of Optometry. The Academy welcomes these new members.

Dr. Frank Brazelton, Los Angeles College of Optometry, 950 W. Jefferson Blvd., Los Angeles, California.

Dr. William N. Brisbane, Los Angeles College of Optometry, 950 W. Jefferson Blvd., Los Angeles, California.

Dr. Gordon W. Findley, R.O., 564 Second St. S. E., Medicine Hat, Alberta.

Dr. David S. Hamilton, 5433 Chester Ave., Philadelphia, Pennsylvania.

Dr. Alden N. Haffner, 156 East 54th St., Brooklyn, New York.

Dr. James A. Lampard, R.O., Royal Bank Bldg., Red Deer, Alberta.

Dr. John C. Lockard, 28 Battery Park Ave., Ashville, North Carolina.

Dr. Edgar Lussier, R.O., 6691 St. Hubert St., Montreal, Quebec.

Dr. Melvin R. Nelson, 111 East Sixth St., Blue Earth, Minnesota.

Dr. Andre Senecal, R.O., 277 East, rue Ste-Catherine, Montreal, Quebec.

Dr. Reynold Senecal, R.O., 8639 St. Denis, Montreal, Quebec.

UNILATERAL BELL'S PALSY — A CASE REPORT*

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This report concerns a young woman, age 37, who had an incomplete paralysis of the right facial nerve following surgery of the mastoid bone. The condition leading to surgery had been present since childhood in a low grade chronic form but occasionally there were attacks that eventually became intolerable. The surgery had been performed about two years prior to the initial consultation.

The patient was a school teacher of the sixth grade; she was intelligent, cooperative, and anxious to have aid for an anomolous ocular condition resulting from the surgery. As a result of the palsy, only the left eye closed in a normal blink reflex. During a blink the only response of the upper lid of the right eye was a slight quiver. The blink rate for the left eye was within normal limits and averaged about 30 per minute.

In order to avoid discomfort from the right eye, the patient had developed the habit of manually closing the right eye every two to three minutes. This procedure reduced the dry, burning sensation but also continually called attention to the anomaly. In addition there was the necessity and annoyance of continuously pulling the lid over the eye.

Following surgery, the patient had moved to Arizona on the advice of her surgeon to take advantage of the hot, dry climate for the mastoidities; however, the climatic conditions operated to her disadvantage from the ocular point of view. In very dry, hot climate or in exposure to wind or moving air, the patient had to keep the right eye closed practically all of the time in order to avoid discomfort. Of particular annoyance was the necessity of keeping most of the windows in a car closed during travel regardless of the temperature. She was most comfortable with the right eye in humid weather; in a smoky atmosphere, comfort only could be obtained by manually keeping the eye continuously closed.

Besides these symptoms of ocular distress, the patient had developed a fear of injury to the afflicted eye. She stated that simple problems like splattering grease at a stove were very dangerous because of the inability to protect the eye by blinking. Of course, spectacles with side

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shields had been tried but with these she could not manually close the eye. Similarly, tasks such as combing hair, holding a baby, brushing of the face by the leaves of a tree, protecting the eye from flying insects, dust, etc., all proved to be either hazardous or difficult or both. In order to further emphasize this problem, one of her experiences is presented: One day she was holding a book to help a student with his work. Without warning, the student turned the page of the book and as a result the cornea was scratched. This proved to be very painful and necessitated that the eye be kept continually closed for a period of time.

Fortunately, in sleep and on forced closure of the eyes normal Bell's phenomena was operating.* As a consequence, in sleep the right eye was elevated and thus covered by the upper lid. In using Bell's phenomena during waking hours to elevate the eyes, the face was distorted as illustrated in Figure 1: of course, the patient wished to avoid this and especially before her sixth grade pupils every few minutes.

In a routine consultation of an optometrist about her vision, she was told about the possible use of a contact lens to lubricate and protect her eye.† This was an entirely new suggestion to her and appeared to be very reasonable. As a consequence she asked and obtained the professional services for the fitting of the lens.

Ophthalmological Consultation. — Before an attempt was made to fit the patient with a contact lens, she was referred to an ophthalmologist for consultation on the health of the cornea as well as an opinion on any method other than a contact lens to meet her need. In particular, the surgical procedure called tarsorrhaphy or facial nerve grafting deserved consideration. With tarsorrhaphy, the palpebral fissure is narrowed by suturing the lids together at one or both canthi; with the nerve graft an attempt is made to provide a pathway for the neurons in the facial nerve stump to the paralyzed muscles.

Tarsorrhaphy was not recommended for this patient because it oftentimes produces noticeable disfigurement of the palpebral aperture even when the lids are in resting position. In addition the cornea appeared healthy except for extremely minimal superficial punctate staining; tarsorrhaphy usually is recommended only if keratitis e lagophthalmo is present.

The nerve graft also was not recommended because the Bell's palsy was only partial: some recovery had taken place but the prognosis for

*Bell's phenomena is defined as the involuntary elevation of the eyes during forced closure of the lids. It should not be confused with Bell's palsy which is a paralysis of the facial nerve.

†The optometrist: Dr. George F. Jones: Salem, Ohio.

Fig. 1. Upper Left. Normal appearance of the eyes without a contact lens. The Bell's palsy is on the right side and consequently the right palpebral fissure is larger than the left. Upper Right. Appearance with scleral fluidless lens on the right eye. Lower Left. Appearance of the patient during a blink. Note that the size of the right palpebral fissure has not changed. Lower Right. Appearance during forced closure of the lids to induce Bell's phenomena. The marked distortion of the face and especially the mouth is evident.

further recovery was very small. If a graft were attempted, the recovered portion may be lost and anomolous regeneration might occur.

The patient was advised to use 0.5% methylcellulose q 1-2 h, and 10% sulamyd ointment qhs. and to check with her local physician every 2-4 months unless an acute episode of redness should intervene.

Optometric Service. — The patient had approximately a spherical cornea in the right eye and a regular sclera. Consequently it was reasonably easy to fit the eye with a scleral type of contact lens. A corneal type of lens was not acceptable due to the immobility of the lid.

A Mueller-Welt, fluidless scleral lens with a diameter of 23.5 mm. was chosen as one which adequately met the needs of this patient. With normal rotations, the bubble pattern of the lens provided a good pumping action for exchange of the tear fluid behind the lens; this factor, together with a looseness of the lids and perhaps a slight reduction in sensitivity of the eye, enables the patient to continuously wear her lens all her waking hours. The patient has found that a drop or two of a medicinal solution for the eye inserted into the lens prior to insertion is helpful. The reason for this probably is the reduced supply of lacrimal fluid resulting from the loss of lid activity.

It is interesting that the refractive error without the contact lens is negligible. The visual acuity with the lens is 20/20 so long as the anterior surface of the lens is moistened; when it is dry, the acuity is reduced to 20/25. Fortunately, the blurredness is not disturbing to her.

Patient Reaction. — The patient reported that the chief advantage of the lens is that it made the eye feel cool; without it, the eye always felt warm and even hot. In addition, she no longer has to manually close her eye nor afford any other than normal protection to it.

ANNOUNCEMENT

STATE OF NEW YORK ACCREDITS OPTOMETRY SCHOOLS

The University of the State of New York, The State Education Department, Division of Professional Education has announced that now three of the non-profit independent Optometry Colleges have been placed on their list of accredited schools. These Colleges are, the Pennsylvania State College of Optometry, Philadelphia; the Massachusetts College of Optometry, Boston, and the Illinois College of Optometry, Chicago. All university affiliated Optometry Schools have been on the accredited list in New York State for some time.

OCCUPATIONAL AND AVOCATIONAL TRENDS AND THEIR IMPLICATIONS IN PRACTICE*

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Many thousands of table saws, band saws, wood and metal shapers and lathes, drill presses, acetylene and electric welding and brazing outfits, power hand drills, and saws, chain saws, paint brushes, and sprayers, trowels and many other appurtenances for that great army of "do-it-yourselfers," are in operation in the home workshops across this land. In addition to the Mr. Buildits who are using these tools, is the greatest army of skilled tradesmen working on the largest number of private dwellings ever under construction at one time.

The occupations of these tradesmen and do-it-yourselfers are close to home. Their activity affects everyone of us. Because of the present and the potential impact on us, there is a need for a broad view of occupational vision in its many forms. The home and commercial construction which is expanding all around us is one of the areas which needs our attention. Whether we live and practice in the prairies of Iowa, the farmlands of the South or in the smoke and activity of a heavy industrial area, the eyes are guiding the hands and feet of the home workman and tradesman with a competence ranging from apparent clumsiness to highly skilled efficiency.

The purpose of this report is, first, to help bring Occupational Vision to the private office where many believe that its practice should begin, and second, to stimulate awareness of the broad areas of this field, which is in need of professional consideration and action.

We are covering three broad areas to emphasize our points: (1) That of your neighbor and mine, the do-it-yourselfers. (2) The skilled tradesman. (3) The changing visual demands in industrial plants.

THE DO-IT-YOURSELFER

Who are these do-it-yourselfers? Some of them are your patients. Some of them, or should I say, some of us are in this group. Your neighbor who is an executive in the bank may have a comprehensive

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set of power tools on which he spends hours of his free time. Are we aware of his occupational vision needs for his work at home, and if so, have we considered eye care for his needs.

The building supply dealers have given a name to those of us who come in to buy a board, a sheet of plywood, special hardware or a pane of glass; they refer to us as the "shoulder trade." The term "do-it-yourselfer" is a broader term. It includes the Hi-Fi addict, the photographic and gardening workers and a host of other occupations. Whatever name might be applied, it is big business and it affects every community.

TIME magazine[1] is but one of the many publications which has reported on this vast field of activity. According to TIME, 11 million amateur carpenters last year worked on 50 million square feet of plywood with 25 million power tools, burned enough electricity to light a city the size of Jacksonville, Florida. Amateur decorators slapped on 75% (400 million gallons) of all the paint used in the U. S., pasted up 60% (150 million rolls) of all the wallpaper, laid 50% of all asphalt tile; and while the menfolk labored mightily, 35 million U. S. women made their own clothes (using 750 million yards of cloth), gave themselves 32 million home permanents, leafed through millions of copies of do-it-yourself magazines and books, looked for still more projects for their husbands and themselves.

Today, U. S. Plywood estimates that 15% of its sales and 10% of the industry's total, 50 million square feet is do-it-yourself business, a 160% jump since 1946.[2]

Further estimates indicate that the manufacturers of the tools are feeling the effect of the "do-it-yourself" program. It is now a 200 million dollar business with a 25% increase predicted for 1954.[1] This is considered to be over eight times the size of the total business in 1946; it is a larger business than the ophthalmic materials industry. It is estimated that by 1960, total sales to the do-it-yourselfers will be well over 10 billion dollars annually.

According to a nationwide survey reported by Georgia-Pacific Plywood Company, do-it-yourself activities are engaged in by two-thirds of the Americans whose home values are from $10,000 to $25,000.[3] Activities range from painting and redecorating home interiors to adding an extra bath or powder room or to building the entire house from basement to rooftop.

According to the Public Utilities Section of the NATIONAL SAFETY NEWS,[13] there is one drawback to the current do-it-yourself trend which is now sweeping the country. This has been revealed in the survey

Fig. 1. (left) The reading add permits this carpenter to see clearly, but the placement of the segment shifts a wasteful work load to the neck, back and other muscles. Fig. 2. (right) The same carpenter wearing double seg triple focus lenses. The unnecessary work load has been lifted from the neck and back by occupational lenses.

recently completed by an insurance company which shows that an average of 638,000 persons in the United States are now suffering disabling injuries each year while doing their own home repair work.

Most of the victims are found among private families residing in single or private dwellings. These families account for about 63% of the total population, yet suffer 90% of all home accidents.

The greatest number of people, more than 180,000 yearly, suffer accidental injury as a result of making their own furniture. These injuries are to eyes, hands, arms and face. Other do-it-yourselfer activities, accounting for large number of accidents include replacing broken windows, exterior and interior painting, repairing or painting chimneys, putting up TV aerials, pruning trees and repairing roofs and gutters. The injuries suffered are of a comparable nature to those experienced in industrial plants before Safety Departments took over. Injuries to eyes plus injuries to face, trunk and limbs, which may be caused by inadequate seeing probably top the list. General carpentry work accounted for 72,000 accidents during one twelve-month period. Of the more than 600,000 accidents recorded, 386,000 fell into the classifications in which a ladder would ordinarily be used to perform the fixing operation. The use of tools such as saws, knives and power machinery, were involved in 252,000 accidents.

Based on repeatedly demonstrated factual evidence we can state that the visual performance of these do-it-yourselfers is one of the factors which contributed to or caused directly some of these accidents.[4] Many of these jobs are performed above eye level, by individuals who are past 40 years of age and who are wearing reading segments placed low in their lenses. To see clearly these workers must hold their heads at a most uncomfortable and inefficient angle, thereby often inducing unsteadiness in muscular control of the body. Injuries to eyes are caused by solvents, grease, lime, paint, slivers of wood, steel or brass. The opportunity for preventive services are very real.

As further evidence of the trend to further activity in the home workshop, SALES MANAGEMENT, reports on the do-it-yourself expositions which are being held in various large cities.[5] The magazine referred to these shows as the "Biggest Exposition Bonanza." The shows started in New York in 1953. They are now scheduled for 15 cities. 107,243 individuals paid admission to one held in New York City. In Chicago the "do-it-yourself" exposition on the Navy Pier had to be closed periodically because the crowds were so heavy that those who had paid admission could not get close to the exhibits they wanted to see.

The do-it-yourselfers are not limited to the low income group. Those in the big salary brackets are just as susceptible as are $2.00 an hour clerks. Former Secretary of State Dean Atchison makes his own furniture. U. S. Steel Vice-President David Austin has a $5,000 wood working shop.[1] Many other notables in the entertainment and business fields use power tools and construct usable, worthwhile items, from yachts and automobiles to "Hi-Fi" and other electronic equipment. The $2.00 an hour clerk can well reason that he will not pay $3.50 an hour to have a job done which he himself can do with the aid of some material from the building supply house and a few power tools of his own. Whatever the motivation may be, the movement is gaining ground rapidly. It re-emphasizes the need for revaluating our concepts of prescribing vision. An awareness of the number of our patients who are *do-it-yourselfers* and of the type of work they are doing, plus action on our part, can surely help to center occupational vision practice in our private offices.

THE SKILLED TRADEMEN

To further emphasize the opportunities for service resulting from increased awareness of the expanding occupational vision needs in each community, let us consider the skilled tradesmen who build and service our homes. This is the "do-it-for-you" group. A Rochester builder has said that a $25,000 house costs $30,000 because of errors that are

Fig. 3. (left) Painting a trim is a tedious, tiring job at best, but doubly so while looking through reading segments. Fig. 4. (right) A better paint job is done more rapidly when vision is right for the job. Double segment lenses release the wearer of unnecessary effort and speed up the work.

made by the builder, by the foreman, his workmen, or by sub-contractors and suppliers. Materials average about 70% and labor about 30% of total home building costs. Errors in the form of poor workmanship or misreading of blueprints may cause the tearing out of a completed section with the resultant wastage of expensive materials and labor. It has been estimated that every new home that is built could have an extra bathroom, or a double instead of a single garage, if it were not for the errors which add expense. Each of us lives in a house or an apartment. Each of us is affected by the added rent we pay or the added cost to the purchase price of the house through oversights and mistakes.

But let's not place all of the blame on the builders. They are uninformed about vision. Just consider the highly skilled electricians, the painters, the carpenters and other tradesmen who are forced to hold their heads up and back in order to see what they are doing above their eyelevel. More time and physical effort is often required to adjust the head, shoulders and back so that the "reading" segment will be in the line of sight than is required to do the immediate job at hand. Of even greater concern is the precarious, accident-inducing position often assumed by this workman in order to see his work. Most of these higher

paid men are above 40 years of age. In order to get vision for the job, they are forced to look through "reading segments which are positioned for easy seeing of the evening paper. These workmen make errors at *our* expense because of their inadequate vision—inadequate at the spot where they need it. They have accidents because of inefficient seeing on their jobs. They become more tired, irritated, frustrated. They take chances. They spoil material and often do work of which they are not proud or they slow down and take excessive time at our expense.

Snell has defined good vision as "that degree of functional visual ability which is adequate for the job at hand."[6] Too often we have prescribed vision to our patients that is adequate for walking down the street, reading a book or sitting at a desk. Are we aware of this vast movement in the construction field which requires a different concept of good vision? For instance, consider the hardwood flooring contractor on his knees with his head pulled back in an unnatural position as he nails the hardwood strips to the subfloor. This man, too, probably is wearing a prescription which may be several years old and which was obtained to enable him to see numbers in a telephone book or to read the evening paper. We speak to these men and suggest how much more easily they could do their work if they had modern occupational lenses that would permit them to see clearly and with facility—without the strained, unnatural, inefficient and tiring position which they are forced to assume with their present glasses.

Why doesn't someone prescribe a modern, case hardened double seg bifocal for these tradesmen? If that were done there would be fewer hammer bruises in the hardwood panels and trim, as well as on the thumbs and other anatomical parts. The mortis and coping joints would fit better. The decorator would leave fewer untouched spots in areas above eyelevel. The flooring contractor would bend fewer nails with fewer mars in the otherwise beautiful wood and would finish his work more quickly with more profit to himself and less cost to us. The effects of this inadequate seeing are all around us.

By adding the feature of safety to the lenses and frames for these skilled men, the injuries to their eyes will be cut to almost zero. Why are not more occupational and safety lenses prescribed for these workmen, and the do-it-yourselfers? The answers do not lie in the lack of ability or know-how, of the practicing optometrist, ophthalmologist or dispenser. In part they stem from the lack of our awareness of the trends that are under way, of the jobs which our patients perform and the lack of awareness on the part of the public of the types of professional ophthalmic services that are available for them. When the barriers

which restrict our giving this service are removed, there will be an upsurge in urgently needed prescriptions for occupations. The public needs to be informed of the importance of vision to our modern occupations, otherwise they may continue to visit their doctor and demand of him that he prescribe the conventional type of glasses which will enable them to observe their neighbors activities, read the hymnbook in church or see the street signs more clearly. The incorporation of the safety features into our prescriptions for the do-it-yourselfer and the skilled tradesmen will bring specific benefits to many. Why not take the lead in this added service. The initiative should be with us rather than with others.

Our factories, offices, schools, automobiles, homes and our construction jobs of this date contain millions of people whose eyes don't hurt but who urgently need visual help. Such individuals need to be identified and informed of their need for your services for their own general well being, for the sake of their earnings, and for more freedom from accidents. They need to have their vision improved so as to meet the demands of modern living. Many of these individuals will have had no previous awareness of lowered visual performance. They have had no symptoms which they relate to their vision. The symptoms which their supervisors, neighbors or family may have observed may be clumsiness, dislike for reading, dislike for the movies or television, drowsiness in the evening, dislike for their job, or there may have been the appearance of pure carelessness. They did not perceive impending danger or potential cause of accidents before they happened. They were careless in their inspection, their assembly was faulty or they apparently were careless in their painting, paper hanging or woodwork. They were sluggish, inattentive or inaccurate in the control of their automobiles.

No other one of our special senses can be synchronized and otherwise improved so readily and effectively and as often as can vision. In spite of these obvious facts we are but now beginning to get the wheels of orderly occupational vision thinking into operation. Eyes for the job is not a new concept. It is new only in a broad general application.

INDUSTRIAL JOBS ARE CHANGING

Recently on a trip to Chicago the writer had an interesting visit with the Industrial Relations Director of one of our large companies with 39 plants scattered across the country. Their business is the manufacture of aviation instruments, airplane parts, electrical appliances, radios, television, washing machines and many other such products. This executive said that one of the interesting discoveries they had made from a recent rewriting of their job descriptions was that 80% of their

jobs in their 39 plans did not exist thirty years ago. Probably the job conditions are changing as surely and rapidly in most other companies. We have said repeatedly that the load is being lifted from man's back and is being placed upon his eyes. To further emphasize this point, the workers of 1954 operate levers, push control buttons, read gauges, read micrometers, assemble complex instruments, drive automobiles, aeroplanes, assemble and inspect electronic parts on the assembly line through microscopes. The time of the day laborer who can get by with casual vision is almost past. He, too, uses power tools. The farmer drives trucks and machines. He keeps books and watches television.

The skilled mechanic and tradesman uses power tools. Modern office buildings do not have row upon row of clerks copying figures by hand. Instead they press the keys of electronic comptometers and calculators and various other business machines in response to visual cues which are picked up from the printed page. We do not pay wages for bone and muscle. Instead, we hire the skilled movements of hands, feet and body. Based on this established assumption we can say that wages are paid today for adequate vision. More usable vision means more skillful, more precise action of these fingers and feet. The skilled action which management pays for is dependent upon the accuracy of visual perception. Even in routine processes, action depends upon vision for its control.[7, 8]

THE INCREASING VISUAL DEMANDS

To further emphasize our need for awareness of the rapidly increasing visual demands of modern living, we should consider the electronic industry which is so rapidly taking additional work from our backs and placing it on our eyes. The day of automation is here. Goodbody & Co., Investment Bankers, in describing the electronic industry from an investment point of view, state:[9]

"Where there is a real lack of general knowledge about electronic investments is in the area involving the little publicized and yet absolutely essential producers of component parts. These parts makers form the very back-bone of the electronic industry. Their past progress and the future potential as a group is fully as great, probably greater than that of many big name companies they supply. The investor seeking appreciation primarily will do well to look behind the publicity front of the framework of the electronics industry to learn who contributes what to the finished product. Before beginning his search, he should be warned that the electronic parts makers will be amazingly easy to find. Like Hollywood starlets there are thousands eager to be discovered. Some of these plants with their exacting visual jobs are just around the corner, across or down the street from us. It is estimated that the military's electronic equipment need might reach 15 billion a year. The reason for this fantastic growth is more easily understood when we realize that the electronic equipment alone in a 1954 jet fighter plane exceeds the cost of an entire plane used in World War II. In the old B-29 bomber there were 530 pounds of electronic equipment, requiring 150 tubes. Today's B-47 has 2,500 pounds of electronic equipment, consisting of 14 separate systems in which are incorporated 650 tubes."

As further evidence of the rapidly changing visual demands, production of electronic units for military use on a really large scale has not yet been attempted. The cost and scope of the mass production of avionic equipment, navigational instruments, gunfiring and bombing controls, landing aids, automatic pilots, detection and tracking devices, communications equipment and the newer items of guided missiles, radars, screens, when it is authorized, staggers the imagination. For peaceful uses, the huge mass production industries, such as the automobile and steel companies are turning more and more to the electronic controls of automation machines. The trend toward the reading of dials and pushing of levers, split second timing and other evidences of the age of vision are very real. They are all around us.

Goodbody predicts that in time "electronic brains" will handle most office paper work such as billing, posting, inventory, control, payroll computation and many other repetitive jobs. Nearly all the record keeping and control needs of large banks, insurance companies, public utilities, merchandising or publishing firms can be systematized so as to be handled by one "electronic brain." The construction time and cost involved in such equipment would require great numbers of electronic tubes or transistors and other electronic components. One version of an electronic brain has over 5,000 tubes and hundreds of thousands of other parts. It is predicted that within five years nearly all large business machine installations will be electronic. These comments further emphasize the changing visual demands of 1955, 1960 and the years ahead.

Our first thought may be that the demand for labor will be cut drastically. The manufacturing of the electronic devices and the operation and servicing of them are highly skilled operations. Millions of employees will be required for these new jobs. Needless to say, many companies that manufacture electronic machines and the component parts use Ortho-Raters and other scientific testing devices to identify those individuals who for their own sake and for their productivity should visit private offices for the improvement of their seeing skills.

The purpose of the quotes from Goodbody is to again emphasize the need for *adequate vision for occupations* which are changing so rapidly. Changing occupations demand a complete break with the traditional concepts which have made distance visual acuity adequate for all jobs and which have placed bifocal segments in the standard position of 2 or 3 mm. below the limbus. The changing industrial movements which we have mentioned are beyond the trend stage. They are here. As a result, the public needs our help more than ever before

and the changes are proceeding at an even more rapid rate. These changes in occupational procedures further emphasize that the vision that was good enough for one generation is *not* good enough for the next.

The trends of the times indicate that our children will have occupations requiring even more exacting visual skills. Adequate seeing for their future as well as for the present should be considered and planned. It is well to ask ourselves, "Does the visual care given to our children today effect their seeing skills of tomorrow?" If the answer is yes, then we should re-assess our efforts toward better care of today's school vision.

We have listed a few of the factors contributing to the expanding need for adequate occupational vision services. Conwell wrote "Acres of Diamonds" to emphasize that opportunities are near at hand as well as far away. Too many of us look at the distant manufacturing plant as the symbol of a successful occupational vision practice. In reality, the opportunities are so often in our own neighborhood, if not with our conventional patients. The road blocks to our giving these desirable services are not immovable. Some of the retardants to our participation are matters of informing the public that the seeing abilities they possess *and how they use them* are related to their productivity, their earnings, their freedom from accidents and to their general well-being.

SUGGESTIONS FOR INFORMING THE PUBLIC

First, we can get more information from each patient about his occupations at home and at work. How many of them are do-it-yourselfers? Are they protecting their eyes? Do they have vision in an adequate range of seeing areas for their outside jobs as well as for their home occupations? We can demonstrate the advantages of Safety Rx frames and lenses for do-it-yourself jobs, for the skilled tradesmen, for the garage mechanics or for the owner of the small factory, such as the one which makes component parts for the electronic industry. For these and for other untouched areas the value of occupational services can be demonstrated to the benefit of all concerned.

Second, the various ophthalmic groups have an opportunity for public service which will result from getting the story of seeing and *how to see* before various business and educational organizations and service clubs. The subject of discussion need not be a dry, static one. It can be dynamic. For example: applying seeing to proficiency in do-it-yourself jobs.

Another occupational vision subject of importance to practically

all of our adult and adolescent patients can be, "How to See While Driving an Automobile." It is a type of instruction that can have a very direct bearing on safe and efficient driving. Furthermore, it is an interesting, valuable and enlightening story for meetings of Parent Teacher Associations, Service Clubs, and other groups. The ability to see an oncoming car or the traffic lines are only the beginning of the art and skill of adequate seeing for driving an automobile safely. Too often we hear authorities in the ophthalmic professions state that 20/100 vision or 20/70 vision is all that is required to drive a car. They point as an example to some oldster with such vision and state, "He has driven for 20 years without an accident." Factual evidence indicates the fallacy of this concept.[11, 12]

How does the safe driver use his eyes as opposed to the cautious driver? The literature is beginning to carry reports of fruitful studies. Smith, in COLLIERS, has given the basis of good vision practices in safe driving.[10] Moffie, at North Carolina State College, is now beginning to uncover pertinent information about some components of vision which have been isolated as being related to accident free driving. Some of these factors are *near* acuity, stereopsis, certain measures of phorias as well as distance acuity.[11] Brody[12] has asked, "Does the individual attend to the scene while driving?" "What does he perceive in relation to what he is *able* to see?" He further states, "One's visual apparatus must be properly *used*" and, "Experimentation with visual training in conjunction with driver education is definitely warranted." How to remain alive and free from accidents through better seeing habits while driving a car is a big subject which cannot be covered in this report. I make reference to it only as suggesting a subject which can be used by us in our appearance before groups of people to show the importance of occupational seeing.

In conclusion, the field of occupational vision is all around us—its bigness is not centered within the gates of industry. Occupational vision is in the offices of the private practitioner. Each one of us should be aware of the desirability for extending his services to meet the urgent need. The prescribing of *safety* prescription and multifocal occupational lenses to conventional patients is being overlooked. The opportunities for public service here are very real.

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CAMPUS ANNOUNCEMENTS

The College of Optometry of Ontario. Toronto, has announced that it will award the degree Doctor of Optometry (O.D.), at the completion of five years of undergraduate professional training. This divided into two years of pre-optometric work and three years of undergraduate professional training.

To receive the degree Doctor of Optometry (O.D.) three optometric colleges now require six years of undergraduate professional training. This is divided into two years of pre-optometric work and four of undergraduate professional training. These Colleges are Pennsylvania State College of Optometry. Philadelphia: Massachusetts College of Optometry. Boston. and the College of Optometry. University of Houston. Houston. Texas.

The remaining nine Optometric Schools and Colleges are all on a five-year basis. These are: School of Optometry. University of Montreal: Los Angeles College of Optometry: Pacific University. College of Optometry: School of Optometry. The Ohio State University: Illinois College of Optometry: School of Optometry. University of California: School of Optometry. Columbia University: Division of Optometry. Indiana University and Southern College of Optometry.

TV RETINOSCOPY*

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TV or television retinoscopy is performed by using a retinoscope to determine the changes in the refractive power of one eye while the other eye is used to view a television screen. This is an extension of our work on book retinoscopy.[1] If the interest in or seeking of meaning from the abstract symbols, that we know as print, can bring about changes in accommodation so that it is no longer postured at the plane of regard, what happens when we view the events of our everyday world? This is not readily subject to determination, but television provides us with a good substitute.

EXPERIMENTAL PROCEDURE I

The subjects, all adults, were seated ten feet from and directly in line with a fifteen inch television screen. The subject was instructed to view the program in a normal manner. Before the set was turned on, the dominant eye of each subject was neutralized in the 180th meridian while the subject looked at the screen. Neutralization was accomplished by means of trial lenses held in the hand of the retinoscopist. Care was taken to stay as close to the visual axis as possible. Each subject was scoped at five minute intervals for a period of thirty minutes. The scope finding and the activity on the screen were recorded together.

RESULTS

The three graphs of Figure 1 are representative of the results obtained. Each graph represents the accommodative activity of one subject. The zero line in each graph is the value of the neutralizing lens for that subject when the set was not turned on. The values to the right indicate an increase in accommodation (more minus than the zero value was required to neutralize the reflex). The values to the left of the zero line indicate a decrease in accommodation (less minus than the zero value was required to neutralize the reflex). The vertical axis gives the time at which each finding was taken and the program material at that time.

Of the sixty findings secured, seven showed less accommodation

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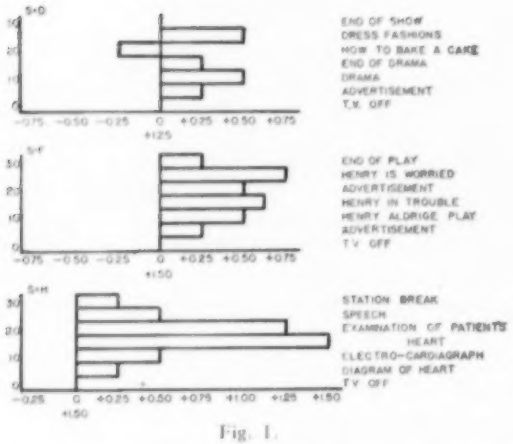

Fig. 1.

when the set was on then when it was off. Four of these findings were secured when an advertisement was on: one, an insipient clown: one, how to bake a cake: and one, during an interview. Apparently, these particular advertisements were not effective. Advertisements in general were accompanied by a decrease in accommodation.

Programs composed of talking, interviewing, singing, and the like, stimulated very little change in accommodation: being on the order of 0.25 D. Plays and murder mysteries, particularly at the climax, stimulated an increase in accommodation on the order of 0.50-0.75 D. Converting our data to inches, we find that while the TV set was at 120 inches, accommodation was postured for 48-39 inches. One subject, while watching a heart examination, increased his accommodation on the order of 1.25-1.50 D. At this time, his accommodation was postured for 25.3 to 21.8 inches. It would seem that the picture should have been blurred for this subject, but such was not reported.

EXPERIMENTAL PROCEDURE II

Nine children, ages 14 and 15, served as subjects. The method of obtaining the findings was the same as in experiment I with the following exceptions. Four retinoscopists obtained the findings. This yielded nine reactions to similar parts of the program. The children were seated in two rows: one ten feet, the other thirteen feet from the seventeen inch screen. The zero point was acquired while the children looked at a Snellen chart placed on the screen.

In Figure 2, the minus values on the abscissa indicate a decrease in the amount of accommodation in use. The plus values indicate an

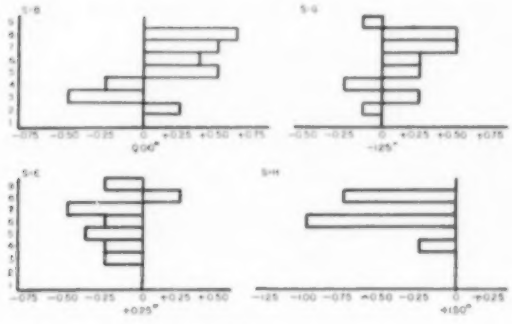

Fig. 2.

increase. In Figure 2, the asterisk indicates the neutralizing lens, minus the working distance lens.

The program being viewed at the time the finding was obtained is indicated by the reference number on the ordinate. The programs were: 1. Snellen chart, 2. first scene of a play, 3. advertisement, 4. second scene of the play, 5. advertisement, 6. third scene of the uninteresting play, 7. jitterbugging scene, 8. height of a murder mystery, 9. end of the murder mystery.

RESULTS

Representative results are shown in Figure 2. These results substantiate those found in Experiment I. During those parts of the program that were not interesting to the children, they began to talk and accommodation decreased. When they became interested, the talking became less and accommodation increased. The changes in accommodation were on the order of those found in Experiment I, 0.50 D. The greatest silence, interest, and accommodative change occurred at the climax of the mystery story.

Subject H is presented in Figure 2 as being non-representative of anything witnessed before. This girl had an amplitude of convergence of approximately twelve inches. When she became interested in the program, her accommodation showed a high degree of vacillation and, contrary to the expected, a decrease instead of an increase in amount. A complete analysis of this subject's visual problem was not obtained.

CONCLUSIONS

1. The amount of accommodation in use by a TV viewer is not constant, but is determined in part by the interest value of the program for the viewer.

2. The amount of accommodation in use increases and decreases as the viewer's interest increases and decreases.

3. When the viewer's interest is neither high nor low, the amount of accommodation in use is that required for the plane of regard.

4. Individuals with certain types of visual problems perform in an atypical manner in that they show a decrease in the amount of accommodation in use as interest in the program increases.

5. Retinoscopy can be used to determine whether or not a TV program is interesting to a viewer.

BOOK REVIEW

THE FIRST FIFTY YEARS OF AN OPTICAL CAREER. Harold J. Stead, Editor, Shuron Rx Technician. Shuron Optical Company, Geneva, New York. 154 pages. Cloth. 1954.

The author of this book is best known to optometrists as the editor of the SHURON R_x TECHNICIAN. As a very young man in 1898 he started working in optical laboratories and over the years became the managing head of several manufacturing firms, making lens blanks and also finished ophthalmic glasses. The Stead Lens Company was one of these and the Stead Bifocal will be remembered by older optometrists.

His career followed the development of the toric lens and later the Kryptok and Ultex bifocal lenses. The author had much to do with the development of these products and he relates the many legal battles that were fought over the patent rights on these products.

About 20 years ago he joined the Shuron Optical Company and since then has made many important studies to perfect laboratory techniques. Much of the present day efficiency of modern optical laboratories is due to these studies and to the author's factual presentation of his material.

In the book optometry plays little part, as the text deals with manufacturing and laboratory problems, but for optometrists interested in the historical background of ophthalmic optics the book will provide most interesting reading and many facts now part of early optical history.

CAREL C. KOCH

THE PROBLEM OF FORM IN VISUAL PERCEPTION*

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I. INTRODUCTION

Visual form perception is a topic that is relevant to all those who work in the area of vision. In spite of considerable excellent work thus far it remains a problem area that resists organization for two main reasons: (1) the data one finds is incomplete, particularly with respect to quantitative research, and (2) the theories are either too broad or too narrow. The broad theories, while all inclusive, suffer from a lack of quantified experimental evidence to support the theories. The theories that are narrow are found to be reasonably well supported by experimental evidence, but are so restricted in scope that they are generally useless in allowing for prediction and control in any practical problem situation.

Let us take a moment to give a brief sketch of the organization of this paper. The organization of this material is primarily from the point of view of a psychologist, with the exception that whenever the writer was aware of relevant experimental data and theories from related fields, this, of course, was also included.

First of all, there will be a presentation of some historical notions of visual perception.

Secondly, the historical background particular to the study of visual form perception including (a) Pre-Gestalt Psychology thinking and (b) Gestalt Psychology theorizing on this subject.

Finally, the contemporary work on visual form perception will be summarized.

II. EARLY CONCEPTUALIZATIONS OF VISUAL PERCEPTION

A. The Distinction Between Sensation and Perception.

The reader will note that thus far the terms "perception" and "visual perception" have been employed. This usage suggests the dichotomy frequently made between sensation and perception. Just as many

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other problems in vision are related to this early dichotomy so is the topic of visual form perception. Essentially this distinction is that a perception is only partially dependent upon sensations that come to us via our senses. Our eyes, for example, provide us with distributions of colors, our ears with distributions of sounds. However, these sensations are only part of the story. The total visual experience that we report (perception) depends upon how these various sensations (or raw materials) are combined.

In vision, as well as all the sense modalities, this distinction between sensation and perception has caused psychologists trouble. For example, in explaining how organisms are able to find their way through (perceive) a three-dimensional world when everyone "knew" that the retina was only two-dimensional (i.e., the sensations were only two-dimensional in nature) psychologists and others found themselves in very awkward positions.

This distinction between sensation and perception led, in the case of visual form perception, to asking such unproductive questions as: "What were the sensations for the perception of a particular form?" One of the answers to this early question was, of course, that basically all visual sensations were merely points of light. From this some assumed that, for example, a line or contour would be made up of a series of adjacent points. Any particular form or shape would consist of a mosaic of light points. Others assumed that a particular line or contour was the elementary visual sensation rather than a series of point sensations, and went on from there much in the same fashion as above.

The extreme view of some nativists, on the other hand, went so far as to assume that all of the essentials of space—location, extensity, etc.—were innate or "given." The point to be stressed here is that regardless of how sensations were handled or theorized about, the problem became one of explaining how the individual made use of these "givens" for everyday visual performance.

A second typical question that was very perplexing was: "How does the total perception of a particular visual event grow out of the sensation?" In other words, granting some particular basic sense data (sensations), how did the full perception come about?

Questions stated in this way tended to emphasize the distinction between what was "out there" to be responded to, and the "response" of the individual to these stimuli. Naturally, the responses of individuals to visual stimuli were soon found to be exceedingly complex. Another way of stating this is that individual differences in responding became particularly evident. Different individuals responded differently to the

same stimuli. Even the same individual did not remain consistent from time to time. Thus the problem of determining how an individual responded became at least as difficult as the problem of determining what he was responding to. For example, how important were an individual's past experiences in determining just what sort of form perception might evolve out of a given set of sensations? This question would be pertinent regardless of our notions of what constitutes an elementary sensation.

We know now that the arbitrary distinction between sensation and perception was recognized as essentially fruitless and only leading to controversy. Tracing the steps that were taken before this realization occurred is not within the scope of this paper. Readers interested in pursuing this further are referred to Gibson's book, "The Perception of the Visual World"[5] where an excellent account of this transition is given. However, the brief statements made here are sufficient to show how involved some of the earlier attempts at theorizing in the area of visual form perception became when the dichotomy of sensation vs. perception was used as a starting point.

B. SPACE AND THE SEARCH FOR ELEMENTS

Several other conceptions were contemporary to the sensation-perception dichotomy. It will be seen that each of these were interrelated and gradually changed. These changes taken together give us some of the more important events leading up to the formulations of the Gestalt School.

The first one had to do with the way in which we conceptualized space. As Gibson[5] has pointed out, the space of the universe for 18th and 19th century philosophers and psychologists was empty Eculidean space, defined by the three dimensions of the Cartesian Coordinates. It seemed to them that perceived space could be divided up naturally into certain geometric categories. For example, *extensity* corresponded to the vertical and horizontal axis in geometry, while the coordinates of x and y in geometry defined *location*. *Shape* or *form*, which is our interest, was thought of in terms of the abstract forms of Greek geometry.

It can now be seen how this thinking was readily translated into looking for the physiological equivalents of this geometric world. As was noted earlier, the sensations were thought by some to be points of light on the retina which supply the "raw materials" for perceiving this geometric world. The next phase of thinking regarded the retina as the site of organization for these points of sensation. Shape or form became mosaics of particular point sensations of light on the retina. Perception still played its part since the projections on the retina were

not adequate to account for the total visual experience reported.

For our second notion we once more turn to the scientific climate of the 18th and 19th centuries. The idea existed for some time that when all of matter was broken down into the lowest common denominator—the elements—we would then be well along the way in our understanding of nature and likewise in controlling it to our satisfaction. This mode of thinking had its counterpart in the social sciences for there was, toward the end of the 19th century, a substantial group of psychologists who were attempting to arrive at the elements of sensation.

These workers, known as "structuralists," believed that the discovery of the "elements" of sensation would permit the reconstruction of all conscious experiences and account for much of psychological phenomena. The presentation of the work of the structuralists would be a paper in itself. However, what should be stressed here is that this school of thought can be seen to align itself on the sensation side of the sensation-perception dichotomy. These two extremes must be appreciated in order to understand developments on the contemporary scene. Before going on, however, let us pause to summarize our arguments thus far:

1. The problem of visual form perception had its early roots in the sensation-perception dichotomy so popular in the 18th and 19th centuries.

2. This dichotomy between sensation and perception proved to be a stumbling block in attempting to understand how we perceive visual form as well as how we perceive in other sense modalities.

3. At the same time concepts of Euclidean space were found to relate to attempts to conceptualize how sensations are combined with perceptions and result in total visual experience.

4. Preoccupation with the seeking of "elements" in the physical sciences was shown to have its counterpart in the behavioral sciences. In particular, for the structuralists, this meant looking for the elements of sensation, and therefore an emphasis on the sensation component of the sensation-perception dichotomy.

Thus, (a) the distinction between sensation and perception, (b) the conceptualization of space in general and its representation on the retina in particular, and (c) the emphasis on the "elements" of experience taken together constitute the major focal points of thinking about visual form perception toward the end of the 19th century.

III. PRE-GESTALT PSYCHOLOGY THINKING

As was pointed out earlier, the structuralists assumed that all

psychological phenomena could be broken down into the essential "elements" of experience. Implicit in their search for "elements" of sensation was the notion that there was a 1:1 relationship between stimulus conditions and the total experience reported by the individual. Thus, for example, in the case of visual form, it was supposed that there was a point to point relationship between the patterns of "elements" of sensation on an individual's return and the particular "form" he reported.

One of the early workers opposed to this notion was Von Ehrenfels[15] who believed that a total experience cannot necessarily be reduced to its parts or "elements." His opposition is of special interest to us since the examples he used were in the area of form perception. (It should be stressed, however, that he meant form in a much more broad sense than is now generally designated by the term.)

One of Von Ehrenfels' classical examples was in the area of music. He pointed out that it was possible to transpose a particular melody from one key to another so that hardly any of the notes ("elements") remained the same, but that nevertheless people had little difficulty in recognizing the tune. He reasoned that this meant that form was in some fashion independent of the particular elements of sensation. He felt that there must, in fact, be a form-quality (Gestaltqualitat) that was something like the color qualities of hue and brightness and likewise incapable of being analyzed into sensations.

Form thought of in this way did not fit into either the category of sensation or perception and therefore could have no equivalent stimulus in the retinal projection. What then were the stimuli for form? Let us turn to a consideration of how the Gestalt theorists attempted to resolve this problem.

IV. EARLY GESTALT THEORY

The Gestalt School of Psychology arose out of objection to the structuralists' interest in searching for elements of sensation. They asserted that no psychological phenomena could be approached or understood in terms of elements. They were strong proponents of the now well known phrase "the whole is more than the sum of its parts." What they meant was that any psychological experience must be studied from the standpoint of being a "whole" (literal meaning of the word Gestalt) and that something was lost when an experience was analyzed into parts.

A classical example of the Gestalt approach is seen in their analysis of a square into its component parts. They argue that while analysis of a square into four lines was possible, no amount of analysis of the

lines taken separately would come up with the quality of "squareness." This particular experience or "attribute," they argued, occurs when the lines are taken together as a "Gestalt" or as a whole. Furthermore they stressed the fact that the retinal projection may vary considerably without making any difference in the reported perception. This fact is referred to in psychology as the "constancy phenomena." As is well known, when we watch a moving car the retinal patterns change tremendously. In spite of this our perception (the car) remains unchanged.

The Gestaltists further noted in some of their experimentation that in spite of the fact that the stimulus presented to the individual might be vague, disorganized, and fragmentary, that which was reported by the individual was nevertheless generally organized, meaningful, and complete. Due to this seemingly "inherent" organization within individuals, in spite of changing stimulus conditions, the Gestaltists gradually changed their thinking, and they started to speculate about *sensory organization* in general, rather than restricting themselves to retinal patterns. The most logical organization point appeared to be the brain, and gradually there emerged a way of thinking about cerebral functioning in terms of "fields of electrical forces." (This was borrowed from physiological studies indicating the activity of the brain to be electrical.)

Hence, the Gestaltists shifted the emphasis from trying to make events occurring at the retina agree with the total perception. Instead they placed an emphasis on brain functioning. Perceived form in this sense becomes "brain form"—i.e., patterns of stimulation in the brain. This permitted them to handle apparent discrepancies between the retinal pattern and the total perception more adequately. At least it appeared to open the way to such a possibility.

Thus the Gestaltists represented the first group of workers to do two things: 1. Seriously recognize the explanation of form as a "problem" to be explained, and 2. Definitely attempt to build a systematic theoretical system to handle the problem.

V. GESTALT APPROACH TO FORM PERCEPTION

Thus far we have been illustrating how the Gestaltists shifted their thinking with respect to research and conceptualization in psychology in general terms. What is now needed is a brief presentation of their thinking about visual form in particular. One of the most complete presentations of the Gestalt position can be found in Koffka's book "Principles of Gestalt Psychology."[10] In this section a brief summary of his arguments are presented as they relate to visual form perception.

A. Homogeneous Visual Stimulation. As a starting point Koffka

considers the results of Metzger's experiments with homogeneous visual stimulation (Koffka, p. 111). Metzger's experimental set-up consisted of having a subject sit, at a distance of 1.25 meters, in front of a carefully whitewashed wall 4x4 meters square. Added to the wall were wings, bent toward the observer, so that the entire field of vision was filled with this nearly homogeneous white surface. Behind the subject there was a projection lantern, which provided illumination over a range from darkness to fairly high levels. Metzger reports:

1. At low levels of illumination the subject will "feel himself swimming in a mist of light which becomes more condensed at an indefinite distance."

2. When the intensity of illumination increased changes began to occur. The "mist" or "fog" which the subject experienced at first gave way to a regularly curved surface which surrounded the observer. The appearance was "filmy like the sky," and not a surface.

3. As illumination increased still more the "surface straightened out into a plane whose apparent distance may increase very definitely beyond the real one." (Koffka, pp. 113-114.)

Koffka concludes the following from Metzger's findings: "Under the simplest possible conditions of stimulation our perception is three-dimensional; we see space filled with neutral color stretching into a more or less indeterminate distance, which may vary with the intensity of the stimulation, although this point is not yet clearly settled." (Koffka, p. 115.)

This conclusion immediately does away with the dilemma posed by the distinction between a three-dimensional world and a two-dimensional retina. The Gestaltists are thus taking the position that perception is innately three-dimensional, even under the most impoverished conditions. That is, the brain was three-dimensional and the processes that were of importance were the forces (electrical) set into motion in the brain by viewing some event in the outside world. (This thinking was, of course, before the more widespread attention paid to the research of Senden[14] and Riesen[15] which disputes the assumption of an innate three-dimensional ability on the part of organisms.)

B. Two Homogeneous Areas Side by Side. In order to be able to handle more common visual experiences Koffka extended his argument to the viewing of two adjacent homogeneous areas. Koffka argued, for example, that being able to see an ink blot on a piece of paper is the result of organization at the cerebral cortex level. Furthermore, the ink blot on a white piece of paper has two important aspects or dimensions: 1. It is seen as a unit; 2. It has a shape.

First of all, the blot is seen as a unit, Koffka states, and at the same time it is segregated from the rest of the field. He believed a general law was implied: "unification and segregation occur when a visual experience consists of two (different) homogeneous areas adjacent to one another." However, he went on to point out that differences in adjacent areas of stimulation (i.e., in our example something black on a white background) are not enough to explain this "law" as had previously been assumed. He cites a simple experiment to demonstrate this point:

1. Two different yet similar patches of grey presented one on top of another will give a perfectly stable organization of a particular figure on a background.

2. However, a deeply saturated blue and a grey of the same luminosity will give no such stable organization in spite of the fact that the two colors are different homogeneous areas.

So we see that the Gestaltists were arguing that mere differences in stimulation (i.e., inhomogenity) do not insure segregation of areas into forms. That is, the breakdown of a particular perception into discrete units is not merely due to a geometrical projection of points of stimulation on the retina. To continue, Koffka points out that the breakdown of a perception into discrete units does not account for the fact that the ink blot has a *shape*. To demonstrate this, Koffka suggests looking at a picture of an irregular square. Looking at this square we note that it can be perceived as being: 1. An irregular square. 2. A kite. 3. A sail on a boat. He stressed the fact that, for all three of the above interpretations, unification and segregation take place along the same boundary lines. Furthermore, he argued, there are laws relating to the perception of shape as well as laws of unit formation and segregation of the total field:

> . . . The shape of our ink-blot or any other figure is the result of forces which do not only segregate the figure from the rest of the field but hold it in equilibrium with the field. There are then forces within the figures and along the contours, a conclusion which we had drawn directly from our experiments. (Koffka, p. 132.)

There are many possible examples that can be used to illustrate what the Gestaltists meant by the "forces" mentioned above. For example, consider a square which is colored ½ green and ½ red. If a circular area of grey is placed on top of this square, such that one-half of the grey circle lies in the green area and the other half lies in the red area, the result is that the circle appears more or less homogeneously grey.

If, however, the circle is bisected by a thin strip of paper, such that now one-half of the grey circle lies in the green and one-half in the red, the half circle ring on the red portion will look greenish, and the half circle on the green field, definitely reddish.

The Gestaltists would point out that introducing the new inhomogenity (the thin dividing strip) altered the total situation. Now, instead of the forces which operated to make the grey ring look as a unit (or whole), counter-forces were set up which interfered with the old forces and made the half-rings appear as homogeneous as possible. This has the effect of changing the total perception that is reported.

To summarize briefly, we see the Gestaltists postulating that: (1) homogeneous areas of different types and patterns will produce forces at their boundaries. Abrupt discontinuity is not enough to account for these forces. Rather, forces develop within the particular homogeneous areas which tend towards simplification of that form. (2) Forces develop external to these areas which also tend to alter their distribution, and (3) the resultant of these external and internal forces is the total perception.

C. Lines and Points as Special Cases of Adjacent Homogeneous Areas. Let us begin first by making it clear what the Gestaltists meant by lines and points. If one homogeneous area is enclosed by another and then the size of the enclosed area reduced in one dimension, the procedure, they argue, leads to a line, either curved or straight. On the other hand, if the enclosed area is reduced in both dimensions this procedure leads to a point.

The above statements are the essence of the Gestalt argument that lines and points are merely special cases of adjacent homogeneous areas of stimulation. From this point on they shifted their experimental focus towards a discovery of the factors (i.e., the forces) which made points and lines appear as particular shapes or forms. Apparently they felt that "simple" form perception had been "explained" (i.e., our ink blot example), and that now it was time to get on to "complex" situations.

D. Special Case of Lines and Points Extended. It is experimentation with lines and points, which in turn are combined to make up complex figures, for which the Gestaltists are now best known. Their approach was, of course, that the perception of complex figures followed particular laws of organization. These "laws" were studiously compiled via extensive research efforts so that by over 20 years ago there were over 110 Gestalt laws to account for perception.

For example, there is the law of *figure and ground*. It is readily apparent that in perceiving a complex visual presentation some aspects of the presentation tend to stand out. This was called "figure." Other parts do not stand out, and this was called "ground." Thus one "law" of organization concerning perception is that every visual perception is organized into parts, some of which are figure and some of which are

ground. There was also the law of *closure*. This law developed from the observation that our perceptions tend to complete incomplete figures. Thus, partially completed figure drawings, as is well known, will tend to be perceived as completed figures. This tendency to render incomplete figures complete was called "closure." It should be stressed that these "laws" of perception developed by the Gestaltists were not thought to be restricted to visual perception. Gestaltists interested in research in learning or problem solving made ready use of such concepts as "closure" described above.

E. Gestalt Approach Concluded. Our understanding of the total problem of form perception will not be enhanced further by pursuing the Gestalt approach more fully. In terms of our interests, the turning point in the Gestalt approach came when they became convinced that they had "explained" how we perceive "simple" form and therefore turned their efforts to research on complex forms made up of lines and points. This research tended to place the Gestaltists on shaky ground, both from an experimental and theoretical point of view. It is unfortunate that this phase of their work has received most attention to the exclusion of areas where they were much more sound.

Contemporary work in the area of form perception is almost exclusively at the level which the Gestaltists abandoned. That is, today we cannot satisfactorily explain the perception of simple forms.

By way of summary of this phase of our paper the following statements appear to be in order:

1. The Gestalt position was the first, historically speaking, theoretical position which was not only cognizant of the problem of explaining form perception, but attempted to systematize an approach to understanding.

2. There is no doubt that the Gestalt movement, with all of its weaknesses, was a powerful factor in getting us to drop the dichotomy between sensation and perception, and abandon the somewhat sterile chase for "elements" of sensation.

3. The main point of departure for presenting the work on the contemporary scene occurred when the Gestaltists departed from a consideration of "simple" form. Contemporary work, we shall discover, is still trying to explain "simple" form perception.

VI. CONTEMPORARY WORK

A. Detection and Recognition Defined. As a starting point two terms need to be introduced because to a substantial degree the two terms represent how contemporary work is divided. They are the terms detection and recognition. Not all authors necessarily use the same terms but

they generally subscribe to a similar two-fold distinction.

1. *Detection*—Broadly speaking the term refers to that level of performance that calls for a distinction between nothing and something. That is, the person can vaguely report that "something" was there to be seen, but that not even a guess could be made as to what the something was. Such a discrimination immediately brings up the well known fact that a distinction between something and nothing, even at the crudest levels, is not without problems. Immediately we have the situations in which: a. The person reports something when nothing is there. b. The levels at which a person says "something is there" are not constant ones, regardless of what the independent criterion may be.

As a result the broad definition of detection is unsatisfactory in practice. As yet we do not have any completely satisfactory definition of what "detection" shall mean. One of the most common is to plot the function that results when correctness of response is measured as a function of changes in increments of illumination. Arbitrarily, the 50% point—that is, the point at which the subject has been correct 50% of the time in determining nothing as against something—is known as the detection level.

2. *Recognition*—Whatever reservations we may have about the definition of detection become small when we come to defining the notion of recognition. Taking the broad point of view first, recognition refers to the ability of not only being able to determine something vs. nothing, but to correctly identify what that something is. In a very vague way it is generally agreed that this level of performance is more complex than detection. Undoubtedly it starts to bring in very difficult variables like past experience, memory, language, etc.

More rigorous attempts at definition have assumed that recognition is merely some more advanced point along the same continuum that we placed detection. Hence for some, recognition refers to the same functional relationship mentioned above except that now recognition is arbitrarily defined as the 75% response point or some point greater than 75%.

With the distinction made above between detection and recognition, the usual experimental approach has been to manipulate some particular independent variable—let us say the total area of a particular form—in order to establish the relationship between area and detection and/or recognition.

(It is useful to examine this contemporary dichotomy—detection and recognition—from the standpoint of how remarkably similar it is to an earlier dichotomy referred to, namely, sensation and perception.

There is an uncomfortable similarity between sensation and detection in that with detection we are interested in the most fundamental or rudimentary level of vision with respect to form. In some ways the people who were looking for sensations had somewhat the same intentions. The same comparison can be made between recognition and perception. The latest dichotomy represents an improvement, however, in that it appears more feasible that the relationship between detection and recognition can be developed whereas the earlier dichotomy had no hope in that direction.)

The distinction made above between detection and recognition includes most of the contemporary work reasonably well. Much of the contemporary work is at the detection level when the term is used in the broad sense. That is, most investigators have been interested in the minimum requirements for essentially simple responses.

B. Area, Edge, and Perimeter/Area. In order to systematize the current work it has been divided up into three main theoretical approaches. There is one group of theorists that stresses *total area* as the main or important variable that determines detection. A second group can be categorized as the persons who stress the *edge* of a particular form as being the most important variable. A third group is somewhat of a combination in that they speak of *Perimeter/area* ratios as being the determining factor. Let us take each one in turn and examine the position in more detail.

1. *Area*—The workers who have stressed area of the particular stimulus as being the important variable for detection, of course, extend back well beyond the contemporary work. Thus we have Ricco's law being formulated towards the latter part of the 19th century in which he postulated that area times intensity was a constant. Or to put it another way, that as area increased the intensity of illumination needed by a subject to detect the area would decrease. For a period this "law" was thought to hold for all sizes of stimuli. In time other workers began to demonstrate that for larger size targets Ricco's law did not hold up. This led to a more articulated picture of the influence of area.

Later workers began to suggest that Ricco's relationship was due to the fact that as area increased the number of receptors in the eye being stimulated increased, and this in turn explained why the threshold decreased.

As experimental controls were improved and larger areas were studied, conflicting data began to be obtained. Thus people like Duntley,[3] Graham,[7, 8] et al, working with both absolute and differential thresholds, began to point out that the relationship between area and

threshold was not linear as size increased. In other words, the earlier workers had been working with very small stimuli and were operating in the straight line portion of a curve which was not straight throughout but more in a shape of hyperbola. It is generally agreed now that the relationship is only linear for stimuli that subtend an angle of less than 10 minutes. As the size of the angle subtend increases, the relationship becomes curvilinear so that increasing amounts of area are necessary to reduce the threshold for detection.

Graham[7, 8] and his associates represent an approach that fits into this category of "area theorists," if such an expression may be used, but at the same time they have made certain modifications in this thinking. They propose that the area-intensity relationship is best handled when provision is made for the fact that within any given area the stimulation provided in the visual system is not constant across the area. Thus, relying on physiological knowledge, they postulate that excitation will be greatest at the center of the retinal image and that the contribution falls off as you leave the center. They also suggest that the distribution of the areas around the center will also be a factor. This, of course, is another way of pointing out that shape itself is a factor as well. This is not to imply that all of the people mentioned above subscribe to the thinking of Graham and his workers, but they all are in general agreement that area is a main contribution. The equation describing this area effect differs between workers as they stress different secondary features.

Other workers began to get still different data when area was manipulated. Some feel that area is *not* the variable and that analysis in terms of area has covered up more essential details which they would prefer to stress. This leads us into the second broad category—namely, edge.

2. *Edge*—There are several workers who have focused more on the edges or borders of the particular figures employed. It is with these workers that the suggestion is put forth that area is not the factor. How the "border" or "edge" is focused upon varies somewhat between workers, and only a couple of representatives theories will be handled here just to give an idea of this type of thinking.

Fry,[4] for example, has done some work on the variables which are important for determining what he calls "the visibility of a border." He has many conclusions in just one of his experiments alone; however, the gist of some of his work points to the fact that detectability thresholds are definitely affected by manipulation of the border of a figure. Thus he concludes that detectability of a figure is not a function of the

width (as long as it exceeds the blur circle) but is a function of the length. (This is for rectangular objects.) Also, the shape of the borders, whether saw-toothed or curved, has an effect upon the threshold. More important, however, he concludes that area per se is *not* a factor. Thus it is more a function of the type of boundary enclosing the area rather than the area itself.

Somewhat this same type of notion is found in the work of Lamar, et al.[9] where they found—for their particular experimental conditions—their data relating area and threshold was neither linear or curvilinear, but produced a family of curves. In their attempts to bring together their family of curves into one function they found it useful to analyze their data along different dimensions. They generated a concept of "useful area" in place of total area. They defined useful area as the area within a specific distance from the boundary of the test object. That useful area, of course, varies somewhat as the total area changes, but thus far it refers to an area between one minute and 1.5 minutes from the edge. Thus, although they have expressed it in a different way, they are akin to investigators such as Fry (and others) in that they too do not stress total area but rather some fraction of it.

Naturally this does not exhaust the workers who should be included in this line of thinking, but the ones mentioned above are certainly representative. From this we can see that it appears that thinking of area alone is not enough, and that perhaps area is an artifact and that the "causal" variables lie within the configuration of the form itself. This leads to our third group which represents a still further modification.

3. *Perimeter/Area*—The number of workers in this area are fewer,[2, 11] yet they must certainly be included in any appraisal of the contemporary literature. Essentially the argument of this third group is that neither area or some aspects of the edge or border is enough, but rather the experimental results they obtain point to a concept of a ratio of perimeter to area. Bitterman[2] postulates that the form detection threshold is a function of the ratio of perimeter to area. The *less* the magnitude of the ratio the *lower* the detection threshold. These workers are in a sense Neo-Gestalts in that their theoretical approach stems directly from the theoretical model postulated by the Gestaltists. Of course, they have made some modifications.

It would not be possible to go into all of the modifications they have made. However, one concept might serve as an example. They have a concept called "critical detail." Thus far this concept has not been fully spelled out. For figures that have somewhere in their peri-

meters 90 degree angles. "critical detail" refers to the length of the arms (or segments) of the figures that form the 90-degree angle. Hence, the greater the length of the arms the greater the magnitude of the critical detail and in turn the lower the detection level for that figure. This is not to imply that such a concept is not without criticism, but is presented merely to give an idea of the type of modification of the general Gestalt approach which they have embraced. Incidentally, it should be pointed out that these particular workers devote a considerable amount of time to speculation at the physiological level (in true Gestalt style) as to what the "causal" factors are in their obtaining such data.

In broad terms this is the contemporary picture summarized by means of three main theoretical emphases. As was said at the outset, the specific findings are often times contradictatory. However, there is such a wide discrepancy between experimental conditions that it is difficult to be sure whether the differences are only apparent or are real. By way of summarization, however, there do appear to be some fairly safe conclusions emerging out of the confusion:

1. Form, as such, is a separate problem that enters into visual performance and needs explaining.

2. Our knowledge is incomplete at the detection level and this information is essential if we are going on to recognition, which is primarily where the perplexing, everyday problems lie in visual phenomena.

3. Area, as such, is not sufficient to explain visual form perception. The same is true of "edge" or "border."

4. An approach which considers both area and boundaries seems to be the direction of future developments.

VII. A WORD ABOUT DEFINITION OF FORM

It may seem strange that the question of definition should not be brought up until the end of a paper. Ordinarily this would be a strange procedure. However, in the case of the topic of form it is necessary since the question of definition is a very complex topic in itself. Some coverage of the literature was necessary beforehand. It appears appropriate to conclude this paper with a consideration of some of the ideas that Gibson presented in one of our psychological journals a few years ago.[6]

Gibson starts his article by pointing out that the term form is used by different people to mean different things at different times. As a matter of fact other terms like shape, outline, contour, configuration, etc., are often used as a synonym for the word form. The many uses

of the word can be broken down into three main categories.

1. One meaning refers to an object in three dimensions.

2. A second meaning is some sort of projection of a form on a flat surface. This may be done by placing a light behind the object. Pictures, drawings, and outlines would fall into this category.

3. Lastly, there is abstract geometrical form composed of imaginary lines, planes, etc. These are "represented" by marks of black on a piece of paper or marks of white on a blackboard for purposes of convenience to help our thinking.

Gibson does not argue that there may not be other meanings of the term form, but the three above are enough to support his argument that such a state of affairs can hardly be tolerated if a scientific attack is to be made in order to determine what the variables are which enable us to perceive form. Gibson then goes on to suggest a series of definitions which are certainly a step in the right direction from the standpoint of defining our subject matter.

What the writer would like to stress, however, is not the completeness of definitions, but a very intriguing idea which goes right along with the definitions. That idea is this: Gibson claims that line drawings, sketches on paper, pictures, etc.—which are used almost exclusively in research on form—are *not* the same thing as form in three dimensions. Hence, it may well be that what we find to be true about the detection and/or recognition of form when the stimuli are line drawings may not be true for the detection of form in everyday life—i.e., three dimensional vision. As Gibson says:

> A drawing is a human production never found in a natural environment: it is complicated by being a thing with which men communicate with one another: it is *not* a simple presentation to sense organs, but a *representation* or a substitute object. As a stimulus for perception it is convenient, but it is far from being the primary or fundamental stimulus which psychologists have usually taken it to be.[6]

If we take this seriously we can immediately see the implications of this in much of our research. We use line drawings, shadow pictures, etc., as a "convenient stimulus" (to use Gibson's phrase) in hopes that the research with these line drawings, shadow pictures, etc., will in turn allow us to generalize to everyday vision of the three dimensional world. At least there is where some of us would like to apply our knowledge. However, we must keep in mind that the "laws" derived to explain form perception based on line drawings, shadow pictures, etc., as stimuli may not be generalized to form perception in the three dimensional world, which is often done by some researchers. It appears to the writer that what Gibson has to say about definition in the area of form perception should have tremendous implications on our future research activities.

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CHAPTER ELECTIONS

MICHIGAN CHAPTER

The newly elected officers of the Michigan Chapter, American Academy of Optometry are: Dr. Ralph M. Howard, chairman, Battle Creek; Dr. George W. Ticknor, vice-chairman, St. Joseph, and Dr. Clarence D. Omans, secretary and treasurer, Battle Creek.

NORTHEASTERN OHIO CHAPTER

The newly elected officers of the Northeastern Ohio Chapter, American Academy of Optometry are: Dr. Kenneth G. Robinson, chairman, Medina; Dr. Arthur A. Schmidt, vice-chairman, Cleveland, and Dr. Paul Wilkinson, secretary-treasurer, Cleveland. The officers and Dr. Lois B. Bing, Cleveland; Dr. Lloyd D. Dolbear, Lorain, and Dr. Joseph A. Wey, Painesville, constitute the Executive Council of the Chapter.

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EDITORS AND STAFF

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ACADEMY CONVENTION AND PROGRAM

The annual convention of the Academy will be held December 10-13, preceded by three days of Post-Graduate Courses, December 7-9, in Chicago, Illinois, at the Drake Hotel. This will be a remarkable series of optometric meetings and a large and enthusiastic group of members and guests are expected to be present.

This is all made possible by the collective work of many members serving on working committees. President Perry will call the convention to order at 10:00 A.M. on Saturday, December 10. He will also preside at the business session, and the round-table banquet on Monday, December 12.

President Perry has also called the Executive Council into session on December 7-9. Members are invited to present problems, suggestions and plans to the Council on these days. Appointments for special meetings with the Council may be made by any member through Secre-

tary Koch, and all members are welcome to attend Council sessions at any time.

The Post-Graduate Courses, December 7-9, are held under the supervision of Ellerbrock and Hummel and their committees. Ellerbrock and his staff will correlate the work of the large group of Post Graduate Instructors while Hummel and his committee will handle the Post-Graduate Course registration.

The convention registration will be supervised by Ehrenberg and Blodgett who will also handle the arrangements for the banquet and the chapter luncheon on Tuesday, December 13. Lawrence Fitch will preside at the Chapter Luncheon.

The general program of technical papers at the convention has been arranged by the Papers and Program Committee with J. Donald Kratz as chairman. Kratz will preside at these general sessions, and will introduce the large group of speakers who will present papers during the four-day sessions.

The five Academy sections, Aniseikonia, Contact Lens Fitting, Orthoptics, Occupational Optometry, and Pathology, are headed by McCulloch, Mazow, Connolly, Sager and Hirsch respectively. Each section has a strong committee and each committee has arranged a most significant program, dealing with its speciality. These section meetings will run concurrently from 9:00 to 11:00 A.M. on Sunday, Monday and Tuesday, December 11-13.

A motor coach trip on Sunday, December 11, will also be made by the entire membership to visit the new Illinois College of Optometry and for a short program at the college. Feinberg and Abram are making these arrangements, and the members will lunch together on the Illinois Tech Campus Sunday noon.

More than one hundred speakers will appear during the Post-Graduate Courses; on the general program of the Academy itself, and at the five section meetings. Most of these distinguished speakers and their subjects have been listed in this Journal, and the detailed program for each of the five sections will be distributed at the registration booth. The general program follows:

Saturday, December 10, 1955

8:30 Registration.

10:00 Business Meeting.
President's Annual Report.
John D. Perry, Jr., O.D.
Secretary's Annual Report.
Carel C. Koch, O.D.
Announcements by Chairman of the Papers and Program Committee. J. Donald Kratz, A.B., O.D.
Announcements by Chairmen of the Sections:
Dr. O. L. McCulloch, Section on Aniseikonia.
Dr. B. Mazow, Contact Lens and Subnormal Vision Section.
Dr. Herman Sager, Section on Occupational Optometry.

Dr. Paul L. Connolly, Section on Orthoptics.
Dr. M. J. Hirsch, Section on Pathology.

11:00 The Relationship Between Distance Judgment, Speed Estimation, and Certain Visual Anomalies as Measured by the Sight Screener.
A. R. Lauer, Ph.D., Professor of Psychology, Director, Driving Laboratory, Industrial Science Research Institute.
John Oliver, Ph.D., Iowa State College.

11:30 Discussion.

11:40 Differential Diagnosis in Optometric Practice.
David D. Michaels, M.S., O.D., Associate Professor of Pathology, Illinois College of Optometry.

12:10 Discussion.

12:20 Luncheon Recess.

1:45 A Quantitative Investigation of the Marcus Gunn Phenomenon.
Lt. Phillip R. Haynes, Optometry Officer, U.S. Army Hospital, Fort Jackson, S. C.

2:15 Discussion.

2:25 Optics of Contact Lenses.
Frederick Sinn, O.D., Pennsylvania State College of Optometry.

2:55 Discussion.

3:05 The Orinda Vision Study. A Preliminary Report.
Henry B. Peters, M.A., O.D., Associate Clinical Professor, School of Optometry, University of California.

3:30 Discussion.

3:40 The Speed of Accommodation as Influenced by Age.
Merrill J. Allen, O.D., Ph.D., Associate Professor, The Division of Optometry, Indiana University.

4:00 Measuring Bifocal Additions.
Gerald Westheimer, Ph.D., School of Optometry, The Ohio State University.

4:30 Discussion.

4:40 Further Studies on the ACA Ratio as Measured on the Orthorator.
Fred W. Jobe, D.O.S., Director, Ophthalmic Research and Development, Bausch and Lomb Optical Co.

5:00 Discussion.

5:10 Dinner Recess.

7:15 Physiological Factors in Multifocal Corrections. Part II.
Robert E. Bannon, D.O.S., Bureau of Visual Science, American Optical Company.

7:45 Discussion.

7:55 Physiological Factors in Mult focal Corrections. Part III.
Harold M. Fisher, O.D.

8:25 Discussion.

8:35 Changes in Fixation Disparity and Heterophoria, During and After Wearing of Prism.
Darrell B. Carter, M.S., O.D., Assistant Professor, College of Optometry, University of Houston.

9:05 Discussion.

Sunday, December 11, 1955

9:00 Section Meetings.

11:15 Buses leave for Illinois College of Optometry, Technology Center, 3241 S. Michigan Ave., Chicago.
Lunch on College Campus of the Illinois College of Optometry.

3:00 Return Buses arrive from Illinois College of Optometry.

3:15 Further Observations on the Correction of Unilateral Aphakia with Contact Lenses.
Alfred Rosenbloom, Jr., M.A., O.D., Associate Professor of Optometry, Illinois College of Optometry.

3:45 Discussion.

3:55 The Relationship of Blurring to Color Recognition.
Arthur Shlaifer, O.D., Ph.D., Pennsylvania State College of Optometry.

4:15 Discussion.

4:25 Scleral Tonometry and Our Experiences in Developing this Technique.
Henry L. Wolfe, O.D., D.O.S., Associate in Wolfe Eye Clinic, Marshalltown, Iowa.

5:15 Discussion.

5:25 Dinner Recess.

7:30 A Critical Survey of Vision Screening.
Vernon Ryan, O.D., F.S.M.C. (London), Instructor in Physiological Optics, Pennsylvania State College of Optometry.

8:30 Discussion.

8:40 Evolution of the Human Eye.
Walter N. Tyszkowski, B.S., M.S., Instructor of Biological Sciences, Massachusetts College of Optometry.

9:10 Discussion.

9:20 An Approach to the Problem of a Corrected Curve Achromatic Cataract Lens.
J. K. Davis, A.B.
Gilbert Clotar, M.S., Research Center, American Optical Company.

9:50 Discussion.

Monday, December 12, 1955

9:00 Section Meetings.

11:10 Post Graduate Education in Contact Lens Field.
John Collins Neill, O.D., Contact Lens Department, Pennsylvania State College of Optometry.

11:30 Discussion.

11:40 An Analysis of Referrals, Based on School Vision Screening Tests.
Hollis M. Leverett, Research Department, American Optical Company.

12:10 Discussion.

12:20 Luncheon Recess.

2:00 Orthoptics for the Non Strabismic and Periodic Strabismic.
Bernard Vodnoy, O.D., D.O.S.

2:30 Discussion.

2:40 Observations Concerning Foveal Fixation Disparity: Subjective and Objective Determinations.
Frederick W. Hebbard, M.S., O.D., School of Optometry, University of California.

3:00 Discussion.

3:10 Experiences with Scleral Tonometry.
Ralph E. Wick, O.D.

3:30 Discussion.

3:40 Statistical Analysis of Hereditary Factors in Ametropia.
R. J. Wixson, O.D.

4:00 Business Meeting.
John D. Perry, Jr., O.D., presiding.

6:00 Cocktail Hour.

7:00 Annual Roundtable Dinner. Some Considerations of Optometrical-Medical Relationships.
Alfred Fitch, O.D., President, Pennsylvania State College of Optometry.

Tuesday, December 13, 1955

9:00 Section Meetings.

11:10 The Optometrist and Psychological Factors in Visual Work.
Charles S. Bridgman, O.D., Ph.D., Director, Bureau of Industrial Psychology, University of Wisconsin.

11:40 Discussion.

11:50 Effect of Refractive Errors on Visual Acuity.
Jack Prince, F.S.M.C., Assistant Research Professor, Department of Ophthalmology, University Hospital, The Ohio State University.
Glenn A. Fry, Ph.D., School of Optometry, The Ohio State University.

12:20 Discussion.

12:45 Chapter Luncheon.

2:30 California Experiments with Prepaid Vision Care.
Henry B. Peters, M.A., O.D., Associate Professor, School of Optometry, University of California.

Bruce D. Jaques, O.D., Chairman, California Optometric Association, Prepaid Health Insurance Committee.

3:00 Discussion.

3:15 Veiling Luminance and Retinal Interaction.
Glenn A. Fry, Ph.D., School of Optometry, The Ohio State University.

3:35 Discussion.

3:45 New Resources in Ophthalmic Lenses.
Robert C. Graham, B.Sc., O.D.

4:30 Discussion.

4:40 Psychological Problems Involved in Frame and Lens Selection for Children.
Margaret S. Dowaliby, O.D., Assistant Professor in Clinical Optometry, Los Angeles College of Optometry.

THE BRADFORD WOODS CONFERENCE

A most interesting and instructive optometric conference was held in Indiana, October 12-13. It was the first of its kind and from the reaction of those who attended it, is a type of meeting which should be repeated and copied in many parts of the country.

The meeting was called the Bradford Woods Conference as it was held at this extensive resort at Martinsville, Indiana. Optometrists from Indiana, Ohio, Illinois, Iowa, Michigan and Minnesota attended the two-day meeting. No formal talks were made and no papers were presented. The group elected a chairman and the meeting was opened for discussion of optometric subjects or problems of interest to those present. No effort was made to come to conclusions on the matters discussed nor were minutes kept, but rather an effort was made to explore many aspects of each question or subject. These lengthly discussion periods in which all participants informally sat around grouped tables and expressed their viewpoints made the meeting of particular value as optometrists with varied interests were there and these men presented their views with vigor.

Among the many subjects discussed were the mechanics of school visual surveys and who should make them; the direction that future undergraduate optometric professional education is to take; phases of optometric public relations programs; the need for, or value of, six years of undergraduate optometric professional training; our contacts with dispensing opticians; optometric professional fees; interprofessional relations with ophthalmology and the value of future optometric legislation and the course or courses it should take.

All conferees were men active in their State Optometric Associations and most were members of the Academy. The meeting adjourned with those who attended, feeling the time had been most profitably spent as all had learned much of value through the exchange of ideas brought about through the generous discussion of various topics placed before the group.

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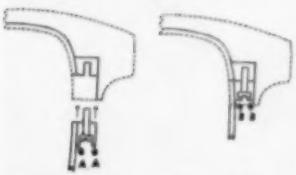

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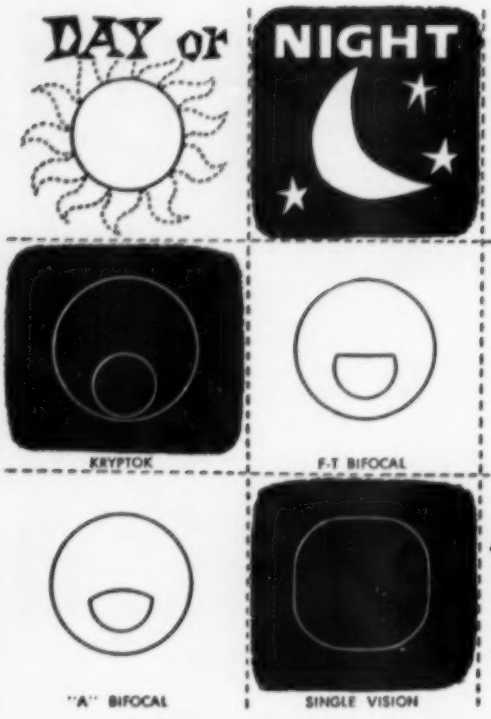

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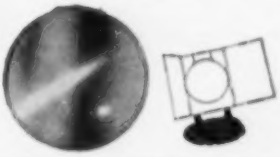

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